aero

Designed to Help Dental Clinic in COVID-19

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Table of Content

Week 5 — — — — — — — - Research of Dental Cinic’s situation in pandemic of COVID-19

Week 6 — — — — — — — - Research, Branstorm & ideation

Week 7 — — — — — — — - Mdterm Presentation

Week 8 — — — — — — — - Design Direction Refinement & Interviews

Week 9 — — — — — — — - Scenarios User Flow & Form Development

Week 10 — — — — — — — - Form Development & CMF

Week 11 — — — — — — — - App Wireframes & Rough Models

Week 12 — — — — — — — - Final Refinements & Models

Week 13+ 14 — — — — — — Final Presentation

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Week 5
Research of Dental Cinic’s situation in pandemic of COVID-19

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Inside a treatment room

Underground piping:

Clean water | Sewage | Electricity | Positive pressure Air (Clean) | Negative pressure air | Data wire

Piping are supposed to be cleaned annually
Hard to achieve, hard to expand

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Dental Clinic Layout

Treatment room 1

Treatment room 2

Treatment room 3

X-Ray Room

Lead lining

Machine Room

Control Room

Operating Room

Disinfection Section

Pump Room

Water Pump

Positive Air Pump

Negative Air Pump

Separate outlet

Disinfection Room

Next to

Trash Room

Server/File Room

Cleaning & Packing

Prep Section (Two way cabinet)

Boiling section

UV Light

Water Sink

Trash Bin

Safety Standard

Space

Interior Design

Equipment

Reservation System

Monitoring System

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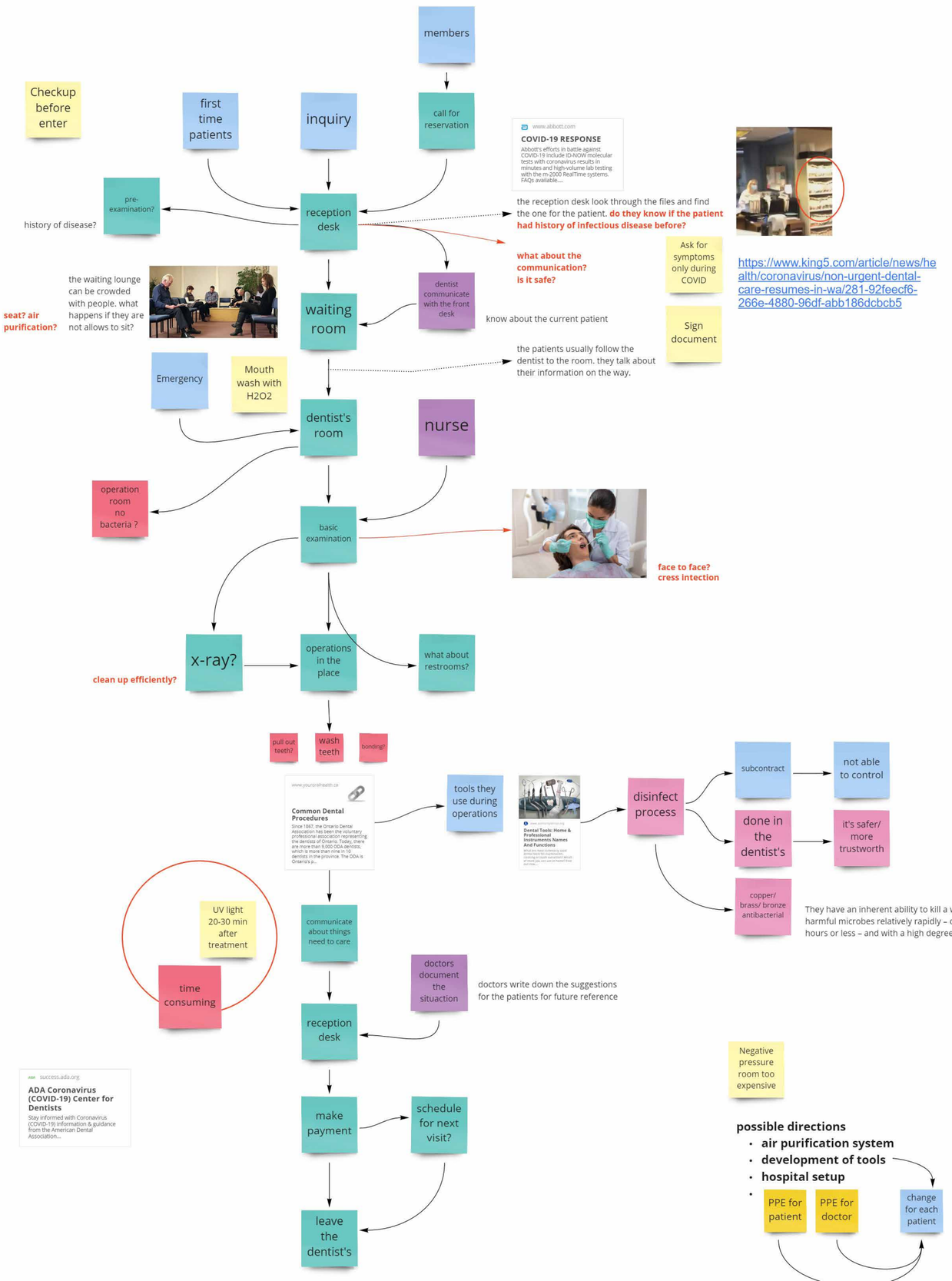

https://www.king5.com/article/news/health/coronavirus/non-urgent-dental-care-resumes-in-wa/281-92feecf6-266e-4880-96df-abb186dcbcb5

Changes made during COVID-19

waiting room
- cancel it if possible/ let the patient wait outside until called by phone
- use plastic or leather chair if possible
- block every other chair

before arrival
- call the day before for the symptoms
- if yes, send pictures before appointment with special tool
- remote session

start appointment
- one staff go out to invite the patient
- only protected staff touch things
- measure temperature
- phones, keys and bags put on a table covered with paper
- wash hand and mouth

during treatment
- aerosol

user experience?

direct/ indirect contact

after treatment
- remote payment
- clean the clinic
- replace head cover
- clean chair with spray and wipes
- change plastic on the light

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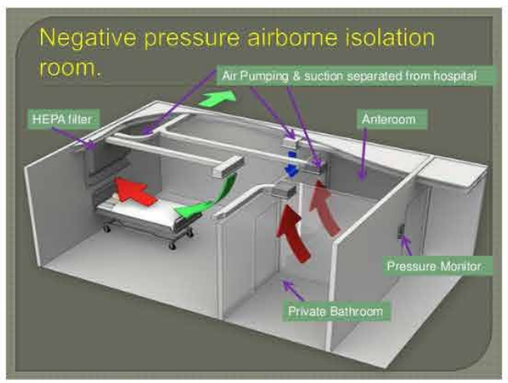
Negative pressure room and other solutions

hospitals are not always ready to handle influxes of infected patients

To prevent unbalanced pressure in the critical negative air rooms, routine checks should be made.

negative air pressure - prevent airborne diseases from escaping the room and infecting other people

- A machine pulls air into the room. Then it filters the air before moving it outside.
- a lower air pressure indoor allows outside air into the room; any air that flows out of the room has to pass through a filter



www.uofmhealth.org

Hospital Isolation Rooms | Michigan Medicine

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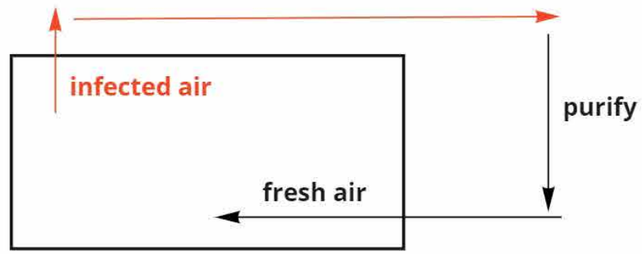
ahgservicesllc.com/post/2016/03/22/title-title



positive air pressure - when a person has a weakened immune system

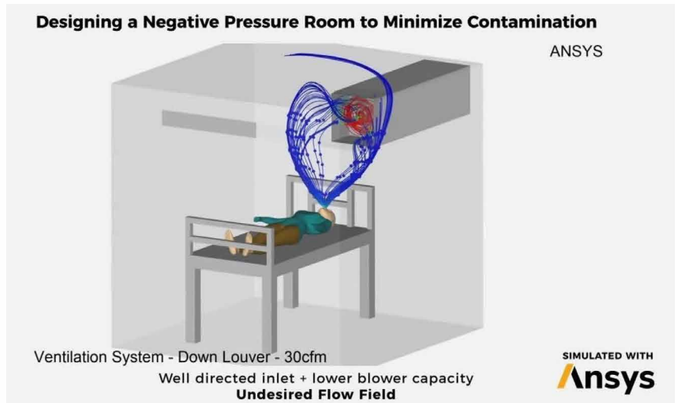
- Clean, filtered air is constantly pumped into the room.
- the use of positive pressure is the location of a habitat in an area where there may exist flammable gases such as found on an oil platform or laboratory cleanroom

use it for the chairs in waiting room?

What can you expect while in isolation?

- Everyone who enters or leaves the room needs to wash his or her hands thoroughly.
- You may be allowed to have visitors. But all visitors and hospital workers must wear masks, gowns, and gloves. In some cases, only certain family members may be allowed to visit. Children may not be allowed. People who have colds, the flu, or other illnesses won't be allowed.
- The door to your room may need to stay closed at all times.
- You may need to stay in your room, except for tests or procedures that can't be done in your room.

density



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Texas dental office reopen

Checking patients' temperature

Plastic cover for chair. Changed after every patient

Vacuum for collecting and filtering any droplet

Incorrect donning of PPE

limit dentists' hand movement

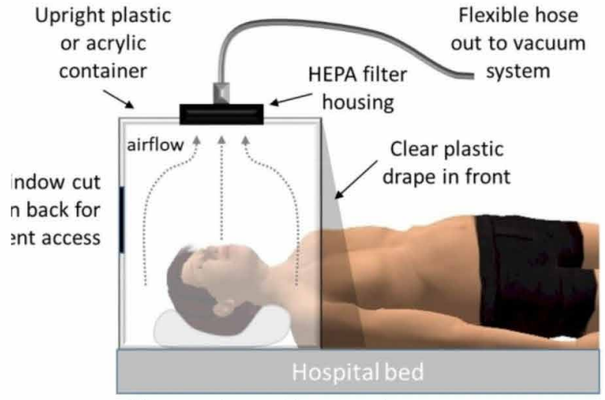
fear/anxiety

"I only have three months supply. More is needed state-wide. I hope the state could give us more PPE. Because that is still a challenge."

Dr. Fred Rabinowitz

Other negative solutions

Lab



* Components are not drawn to scale

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Reopen guidance and PPE

ADA
American Dental Association®

Precautions during Pandemics

-**Minimize time** in waiting room
-**Spacing** emergency patients 6 feet apart
-Consider having patients wait in their cars & be called in via phone/text
-When providing service in an integrated health system with medical services, consult with medical colleagues to review protocols and make necessary adjustments to have the above steps as some jurisdictions may have stricter recommendations

Continue practicing standard precautions

-PPE
-Sterilization
-Surface disinfection
-Handling sharps
  -Be care of cutting the gloves/PPE
-Reinforce trianing

www.epa.gov

List N: Disinfectants for Use Against SARS-CoV-2 (COVID-19) | US EPA

Search EPA's list of registered disinfectants for use against SARS-CoV-2, the virus that causes the novel coronavirus (COVID-19). ...

Products that kill virus within 5 minutes

66 Heavy Duty Alkaline Bathroom Cleaner and Disinfectant

Avert Sporicidal Disinfectant Cleaner Wipes

Micro-kill bleach germicidal bleach wipes

Surface cleaning for both tools and other dental equipment like dental chair, and other surfaces

Return to Work Interim Guidance Toolkit

ADA

Overview

This toolkit contains interim recommendations from the American Dental Association's (ADA's) Advisory Task Force on Dental Practice Recovery. Since this is interim guidance, it is focused on the short-term management of dental practice during the COVID-19 pandemic as some offices return to providing non-emergent care. Details not specifically addressed in this interim guidance will be left up to the professional judgment of each dentist. The possible integration of additional infection control measures, air purification systems, and any other safety recommendations will be addressed by the appropriate ADA agency as the COVID-19 knowledge base grows.

The ADA Task Force was convened to advise in the development of tools to support dentists who are returning to work after the COVID-19 closures and practice restrictions. It is recognized that different areas will return to a more familiar style of practice at different times, and under different circumstances. Each dentist will need to incorporate their clinical judgment with their knowledge of the incidences of COVID-19 cases in their area, the needs of their patients, and the availability of any necessary supplies to re-engage in the provision of elective dental care.

Due to the evolving understanding of the world's knowledge of SARS-CoV-2, it is expected that more recommendations will be brought forward that might impact how dentists deliver care. Further information and recommendations will be provided to our members as it becomes available.

The ADA recognizes that as of May 1, 2020 the Centers for Disease Control (CDC) recommends postponement of elective procedures, surgeries, and non-urgent dental visits. As various jurisdictions ease restrictions on provision of non-emergent care the ADA offers this Return to Work Interim Guidance Toolkit.

For COVID-19 resources from the ADA, visit the ADA Coronavirus (COVID-19) Center for Dentists at ADA.org/virus.

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Last Updated: 4/9/2020 1

- **Welcome back Reassurance Letter**
- **Pre-appointment Screening Process**
- **In-office patient Registration Procedures**
- **Reception Area Preparation Strategies**
- **Chairside Checklist**
- **Staff Protection Strategies**

What are droplet precautions?

- For patients known or suspected to be infected with pathogens transmitted by respiratory droplets that are generated by a patient who is coughing, sneezing, or talking.
- Put a mask on the patient
- Place patient in a single room
- Don a mask upon entry into the patient room and leave it on
- Wear a respirator when treating patients diagnosed or being investigated for COVID-19
  - If supplies of respirators are limited, prioritize N95 respirators for procedures that generate respiratory aerosols and wear masks for other procedures.

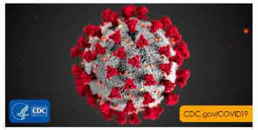
PPE for both patients and dentists

What else can we do?

- Prepare for when normal operations resume
  - Clean and stock clinics
  - Follow any screening protocols recommended by health authorities for accepting patients and returning to work
- If you have excess stock of PPE critically needed by frontline healthcare workers consider contacting your local hospital to see if you can share the excess stock
- Continue to monitor reliable sources of information such as CDC, ADA, and OSAP

Not taking off any mask or gloves before the dentist leaving the room

CDC
Centers for Disease Control and Prevention



www.cdc.gov

Coronavirus Disease 2019 (COVID-19)

Coronavirus disease 2019 (COVID-19) is a virus (more specifically, a coronavirus) identified as the cause of an outbreak of respiratory illness first detected in Wuhan, China. ...

Ensure that you have the appropriate amount of personal protective equipment (PPE) and supplies to support your patient volume. **If PPE and supplies are limited, prioritize dental care for the highest need, most vulnerable patients first.**

Telephone screen all patients for symptoms consistent with COVID-19.

Remove toys, magazines, and other frequently touched objects that cannot be regularly cleaned or disinfected from waiting areas.

中华口腔医学会
Chinese Stomatological Association

cn.dental-tribune.com

武汉大学研究人员制定对于牙医和牙科学生的新冠病毒防护指南

- Body temperature testing and recording for every patience
- Gargle with anti-virus/bacteria antiseptic mouthwash
- Saliva ejector is needed

Not killing the virus but reduce the droplet

0.2% povidone iodine

Hydrogen Peroxide Mouth Rinse 0.5-1%

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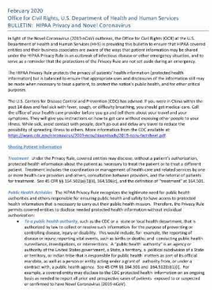
Patience privacy & history



February 2020
Office for Civil Rights, U.S. Department of Health and Human Services
BULLETIN: HIPAA Privacy and Novel Coronavirus

In light of the Novel Coronavirus (2019-nCoV) outbreak, the Office for Civil Rights (OCR) at the U.S. Department of Health and Human Services (HHS) is providing this bulletin to ensure that HIPAA covered entities and their business associates are aware of the ways that patient information may be shared under the HIPAA Privacy Rule in an outbreak of infectious disease or other emergency situation, and to serve as a reminder that the protections of the Privacy Rule are not set aside during an emergency.

The HIPAA Privacy Rule protects the privacy of patients' health information (protected health information) but is balanced to ensure that appropriate uses and disclosures of the information still may be made when necessary to treat a patient, to protect the nation's public health, and for other critical purposes.

The U.S. Centers for Disease Control and Prevention (CDC) has advised: If you were in China within the past 14 days and feel sick with fever, cough, or difficulty breathing, you should get medical care. Call the office of your health care provider before you go and tell them about your travel and your symptoms. They will give you instructions on how to get care without exposing other people to your illness. While sick, avoid contact with people, don't go out and delay any team to reduce the possibility of spreading illness to others. More information from the CDC available at https://www.cdc.gov/coronavirus/2019-ncov/downloads/2019-ncov-factsheet.pdf

Sharing Patient Information

Treatment: Under the Privacy Rule, covered entities may disclose, without a patient's authorization, protected health information about the patient as necessary to treat the patient or to treat a different patient. Treatment includes the coordination or management of health care and related services by one or more health care providers and others, consultation between providers, and the referral of patients for treatment. See 45 CFR §§ 164.502(a)(1)(i), 164.506(c), and the definition of "treatment" at 164.501.

Public Health Activities: The HIPAA Privacy Rule recognizes the legitimate need for public health authorities and others responsible for ensuring public health and safety to have access to protected health information that is necessary to carry out their public health mission. Therefore, the Privacy Rule permits covered entities to disclose needed protected health information without individual authorization:

- To a public health authority, such as the CDC or a state or local health department, that is authorized by law to collect or receive such information for the purpose of preventing or controlling disease, injury or disability. This would include, for example, the reporting of disease or injury, reporting vital events, such as births or deaths, and conducting public health surveillance, investigations, or interventions. A "public health authority" is an agency or authority of the United States government, a State, a territory, a political subdivision of a State or territory, or Indian tribe that is responsible for public health matters as part of its official mandate, as well as a person or entity acting under a grant of authority from, or under a contract with, a public health agency. See 45 CFR §§ 164.501 and 164.512(b)(1)(i). For example, a covered entity may disclose to the CDC protected health information on an ongoing basis as needed to report all prior and prospective cases of patients exposed to or suspected or confirmed to have Novel Coronavirus (2019-nCoV).

3

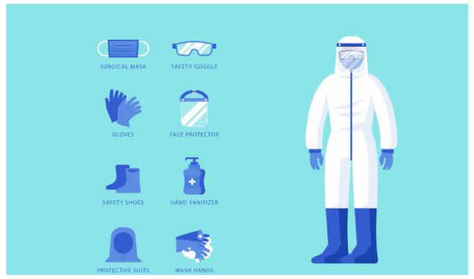
Access with permission

Special cases with exception

With HIPAA patients can confine who approaches their well-being data, however human services suppliers need to share data to maintain a strategic distance from unsafe medication communications, and to keep away from treatment decisions which could hurt them in view of your well-being history.

Dental specialist does not have simple access to your whole restorative record. He or she could contact your family doctor and request insights in regards to your general well-being and prescriptions. That data can be shared between human services suppliers.

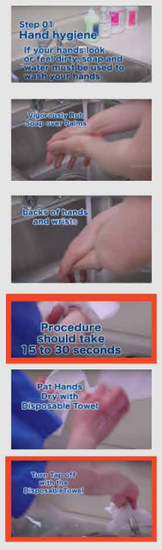
PPE resource & improvement



Donning & doffing process

Two separate rooms for donning & doffing

Change PPE after every patient



Special steps for taking off gloves

Further sanitizing of magnifiers

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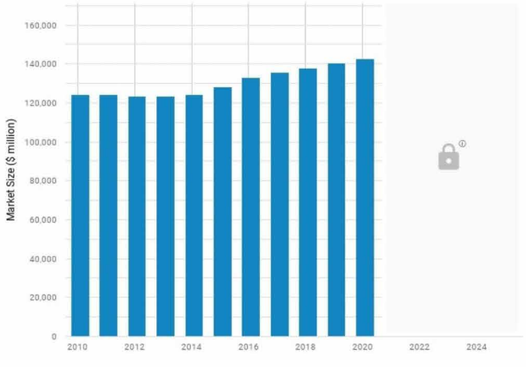
Current Market

Dentists in the US Market Size 2001–2026



$142.6bn Dentists in the US Market Size in 2020

1.5% Dentists in the US Market Size Growth in 2020

2.2% Dentists in the US Annualized Market Size Growth 2015–2020

Dentists in the US Market Size Growth 2020–2026

Curious about **what drives these trends**? IBISWorld's **Dentists in the US Industry Report** has got you covered.

VIEW INDUSTRY ANALYSIS

Covid-19 Impact Update

IBISWorld's analysts constantly monitor the industry impacts of current events in real-time – here is an update of how this industry is likely to be impacted as a result of the global COVID-19 pandemic:

• **Revenue** for the Dentists industry is anticipated to decline due to social distancing requirements.
• Most practices have closed, **only reopening for essential procedures and emergency visits**. As a result, industry operators are expected to generate significantly less revenue in 2020.
• Several provisions within the CARES Act may provide some measure of relief for industry operators. However, the industry is ultimately expected to see a decline in industry operators due to practice closures.

Revenue decline

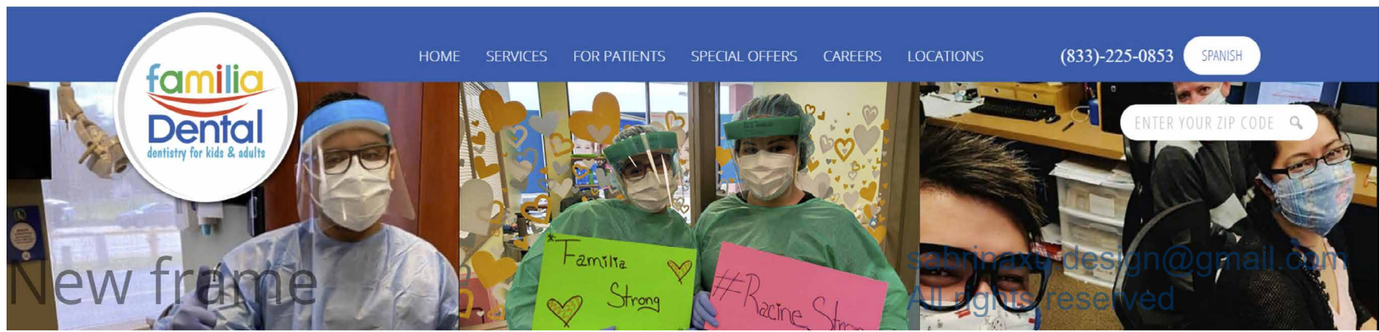
Dental Industry Trends

- Creating and Maintaining a Trustworthy Persona
  - Overcoming fear: education will increase new patient registration efforts
  - A new and robust content marketing campaign can help you get in touch with patients attract new dental patients
- Online Review Management
  - Google, Facebook, and Yelp
  - Dental review websites: 1-800 Dentist, CareDash, and Dentists.com
- The Rising Value of Convenience
  - An online portal
  - Expanded office hours
  - pay online or from their mobile devices
  - Adding additional services
- The Continued Use of 3D Printing in Dentistry
  - Short-term and long-term dental solutions
  - excellent finish, fine feature details
- Staying on Top of Changes in Social Media
  - Ephemeral content
- Optimize for Voice Search
  - Focus on natural-sounding language
  - Assume that most queries will be questions
  - Think about user intent
  - Answer questions clearly and concisely on your website
- Personalized Content
  - adaptive content
  - Targeting potential patients with specific ads based on their behavior on your website or on their location, age, or past visits
  - Creating groups on Facebook and sharing targeted content that's tailored to the preferences of the group's members
- Focus on the Patient Experience
  - Adding video content in your waiting area, including a mix of entertainment and educational content
  - a larger concierge service package
  - minimize their time in your waiting room

What's on the Market

https://www.familiadental.com/covid-19/

Familia Dental is taking extra precautions to keep our communities safe. It's our Safe Dental Care commitment, and you'll find it at every one of our 42 locations across six states.



New frame

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Dental Clinics Types & Market

Cost:
Depending on location and a number of other factors, the cost to build a new dental clinic or renovate an existing building to suit a dental clinic can range from **$100 to $200 (or more) per square foot (not including equipment).**

Dental Clinic Comparison Chart

Safety Net Dental Clinic Manual | safety net DentaQuest | OHRC

Dental Clinic Comparison Chart: Capacity and Costs for Fixed Clinics, Mobile Clinics, and Clinics Using Portable Equipment

	Fixed*				Mobile	Portable
Size	3-chair 1,800 sq ft	6-chair 2,925 sq ft	9-chair 3,493 sq ft	12-chair 3,970 sq ft	2-chair	2-chair
Patients Treated/Year	1,472-1,619	2,944-3,238	3,754-4,858	5,886-6,477	500-800	500-800
Visits/Year (DDS+DH)	3,680-4,048	7,360-9,096	9,384-12,144	14,720-16,192	1,400-2,000	1,200-1,600
Start-up Costs						
Remodeling ($148/sq ft)						
Construction ($215/sq ft)	$387,000	$628,875	$750,370	$853,550	$400,000-500,000	N/A
Large Equipment	$156,320	$312,640	$468,960	$625,280	$21,813 Most equipment is built into unit	$20,982
Supplies, Instruments, and Small Equipment	$47,795	$70,590	$93,385	$116,180	$26,319	$26,319
Annual Operating Costs						
Staff (may not include benefits) Dentist average salary Director $147,361 Staff $125,882	1 $147,361	2 $273,243	3 $399,125	4 $525,007	1 $125,882	1 $125,882
Dental assistant Average salary $35,621	2 $71,242	4 $142,484	6 $213,726	8 $284,968	2 $71,242	2 $71,242
Dental hygienist Average salary $70,425	0.5 $35,212	1 $70,425	1.5 $105,637	2 $140,850	N/A	N/A
Clerical/receptionist Average salary $33,588	1 $33,588	1 $33,588	1 $33,588	1 $33,588	N/A	N/A
Practice manager Average salary $67,225	0	1 $67,255	1 $67,255	1 $67,255	N/A	N/A
Utilities average $9,467 to $12,924	$9,467	$10,619	$11,723	$12,924	Varies 50 to $4,000	N/A
Rent or mortgage payment average $31,212	$29,238	$30,408	$33,000	$34,083	N/A	N/A
Dental supplies $8/per visit for fixed clinic (multiplied $8 by the visits on the high range)	$32,384	$64,768	$97,152	$129,536	$15,298	$15,298
Other (charts, office supplies, etc) $2,611 to $5,762	$2,611	$3,986	$4,856	$5,726	$2,611	$2,611
Total start-up costs	$591,115	$1,012,105	$1,312,715	$1,595,010	$453,330	$ 47,301
Total annual operating costs	$361,303	$696,776	$966,062	$1,233,937	$219,033	$215,033
Total first-year costs	$952,218	$1,708,881	$2,278,777	$2,828,947	$672,636	$262,334

Not cost effective to purchase dental chair + new truck charges than hand chair

* Fixed locations may include a free-standing facility, community health center, hospital, school or other location.

** Cost is based on 2016 salaries in the nation from Salary.com and 2004 equipment/supply costs from one vendor in the Northeast.

*** The chart is only a sample and reflects average costs across the nation and typical staffing models for safety net dental programs. Staffing models can vary depending on patient population, and the mission of the oral health program. Costs vary based on location and therefore research needs to be done to obtain accurate costs.

Common Types of Dentists

- General Dentist — provide regular teeth cleanings and routine dental exams
- Pedodontist or Pediatric Dentist — specialize in dental care and treatments for children and youth
- Orthodontist — specialize in teeth and jaw alignment, using wires, braces, retainers, and other devices
- Periodontist — help treat and repair diseases and problems of the gums
- Endodontist — deal specifically with issues troubling the nerve of a tooth
- Oral Pathologist or Oral Surgeon — specialize in the treatment of oral diseases of the teeth and jaw
- Prosthodontist — repair teeth and jaw bones. They provide cosmetic dentistry, or treatments to improve the appearance of teeth

New frame

Mobile Dental Clinic

Especially in rural areas

What Types of Portable Dental Office Equipment Are Available

- Tray and Equipment Stands
- Air Compressors
- Delivery Systems
- Handpiece Systems
- Patient Chair
- Instrument Trays
- Operatory Stools
- Operatory Lights
- Suction Units

Dentists on Wheels in SoCal

USC Mobile Dental Clinic

Opportunity

- **PPE REDESIGN**
  ---Dentist glove & gown
  ---Goggle
  ---Facial shield
- **Dental equipment**
  ---Integrated solution
  ---Dental chair
  ---Air circulation/vacuum device
  ---Temperature checking for entrance
- **Mental wellbeing**
  ---Safety
  ---Review system
  ---Build trust
  ---Eliminating fear
- **The form of the clinic**
  ---Mobile
  ---Portable
  ---Telemedical / virtual diagnosis

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Week 6
Research, Branstorm & ideation

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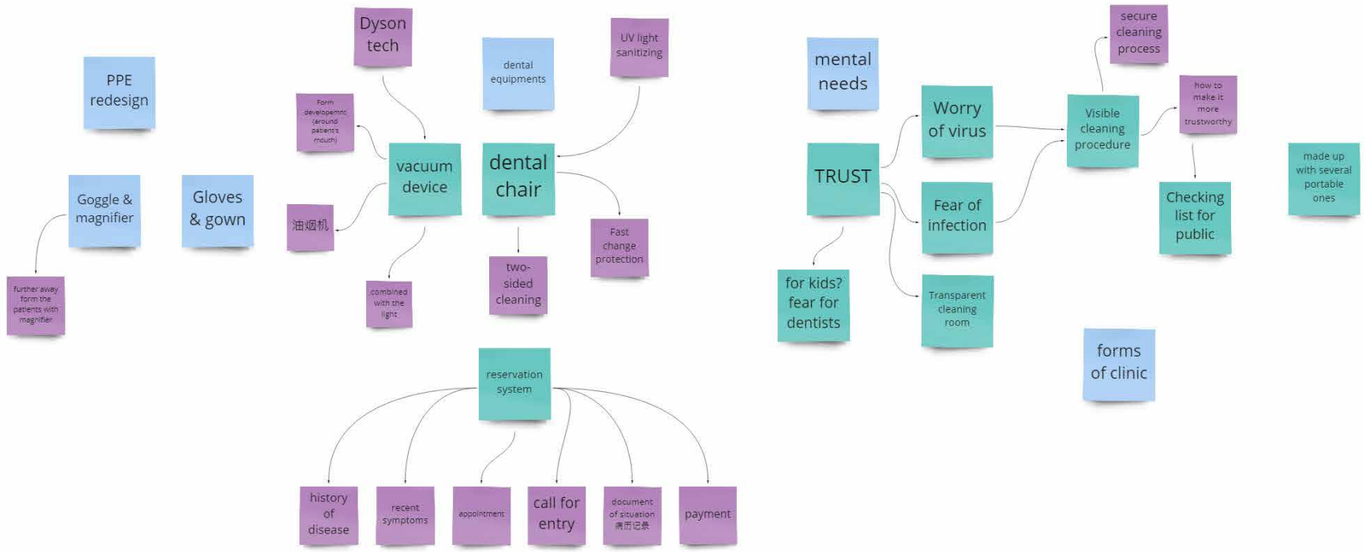
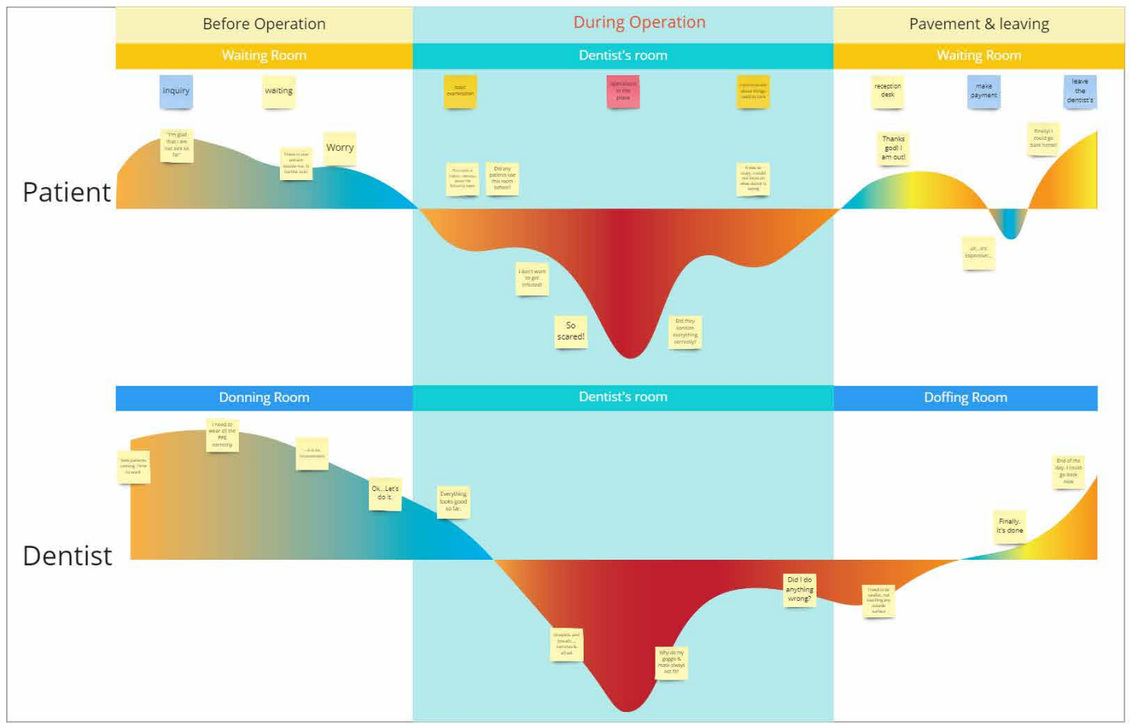
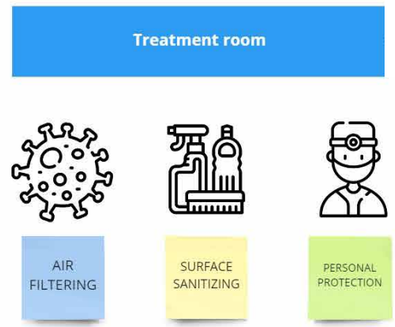
Mindmap



Posture & Emotion Study





HMW improve the air sanitizing/filtering during the treatment

HMW minimize the environmental impact of PPE

HMW redesign the dental PPE & other equipments for efficiency

HMW improve the sanitizing process of tools / equipments

HMW prevent the infection between dentists & patients

HMW build up patients' trust of taking treatment during pandemic

HMW improve the interior design of dental clinic for preventing infection

HMW improve the reservation system based on social distancing

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Design Goals

Safety | **User friendly** | **Trust** | **Environmentally friendly** | **Affordability**

Directions

Dentist protection

Devices for tools & surface sanitizing

Devices for air circulation & filtering

Prevent the infection between dentists & patients

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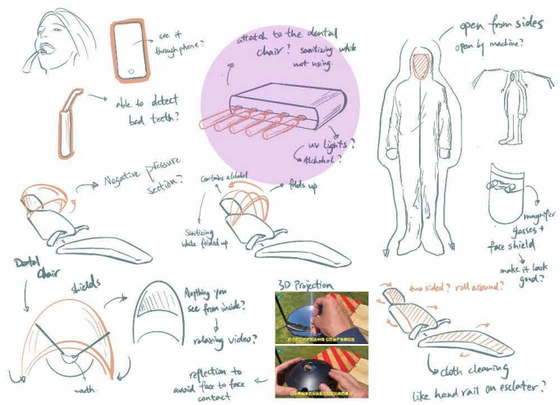
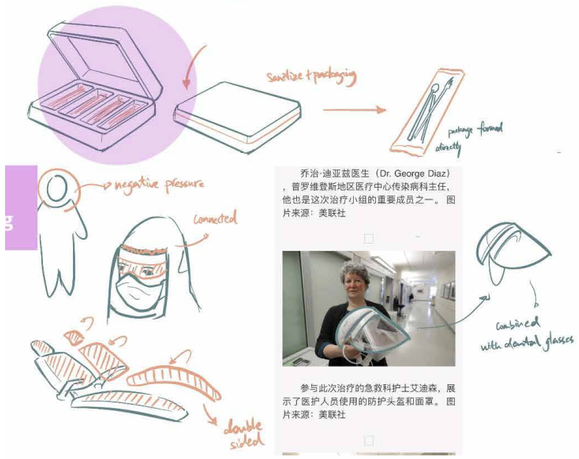
Concepts

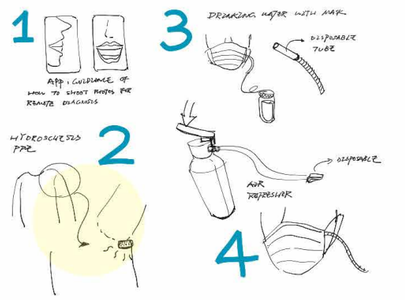


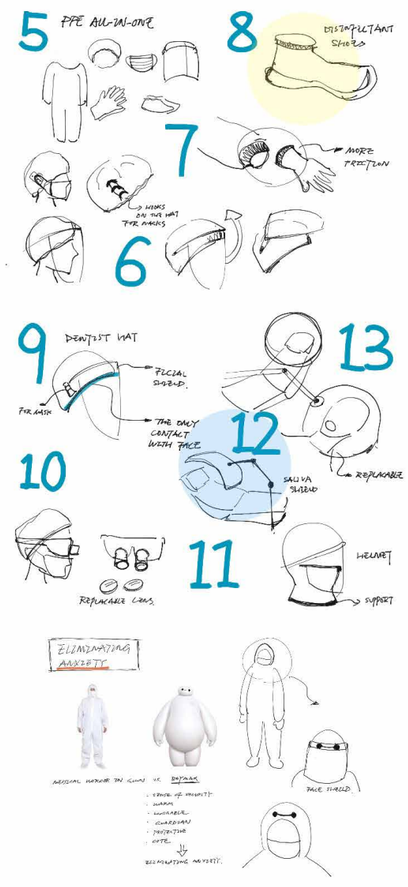


乔治·迪亚兹医生（Dr. George Diaz），普罗维登斯地区医疗中心传染病科主任，他也是这次治疗小组的重要成员之一。图片来源：美联社

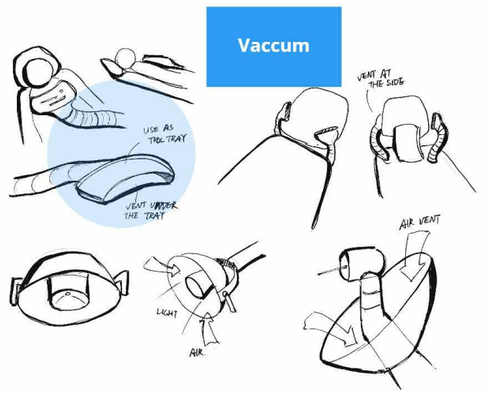
参与此次治疗的急救科护士艾迪森，展示了医护人员使用的防护头盔和面罩。图片来源：美联社

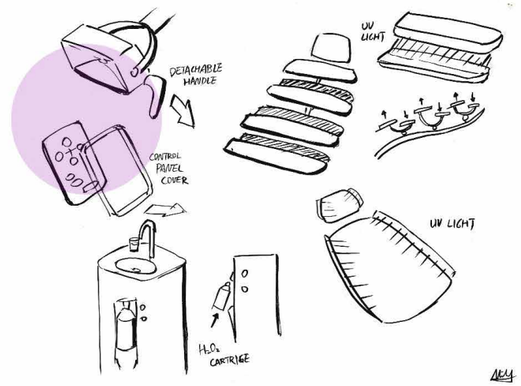
PPE

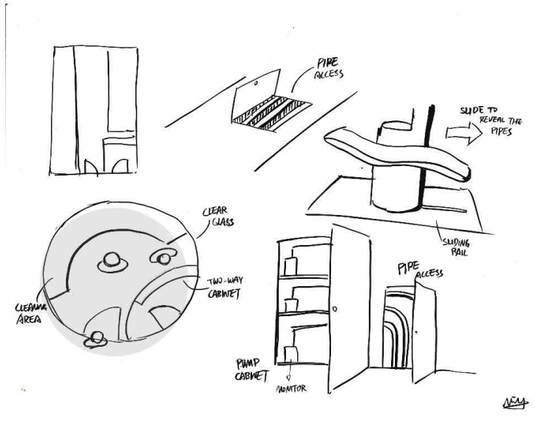


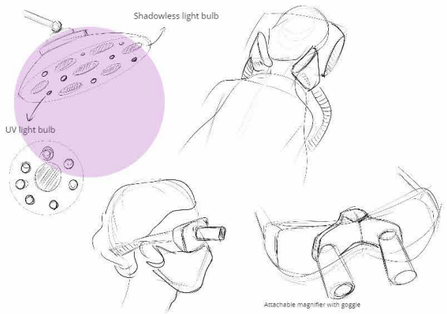


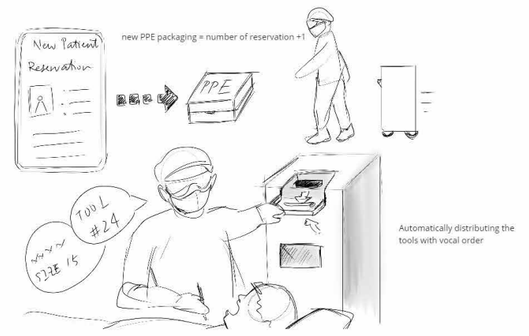
Vaccum



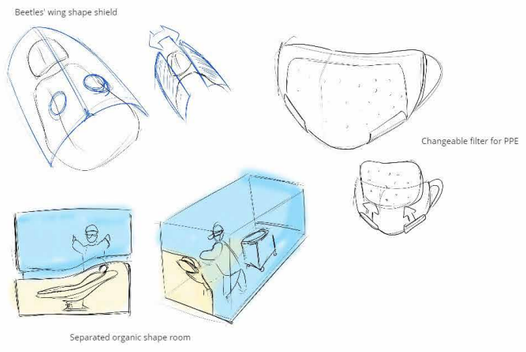








Automatically distributing the tools with vocal order



PPE | **Vaccum** | **Tool sanitizing**

Room Sanitizing | **UX in treatment**

Fear/concerns of patients & dentists

Future sanitation opportunity

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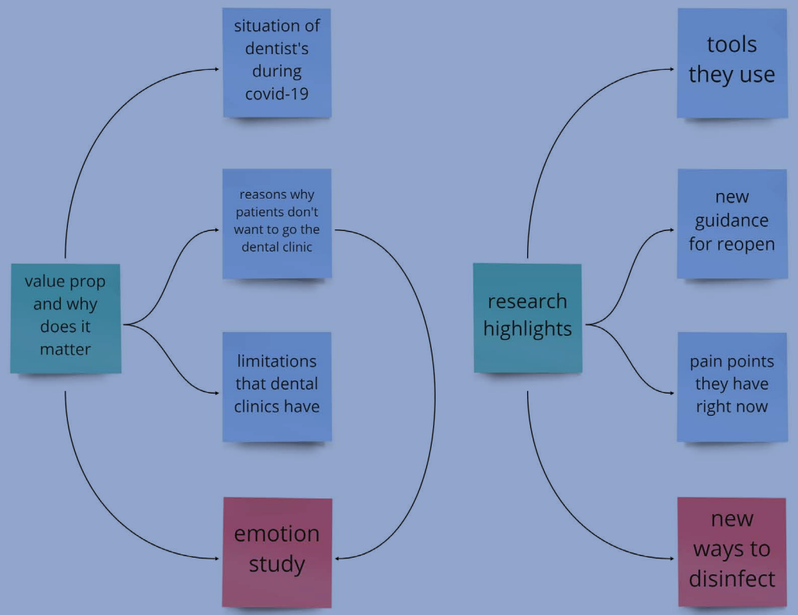

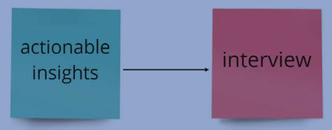

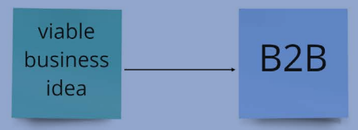

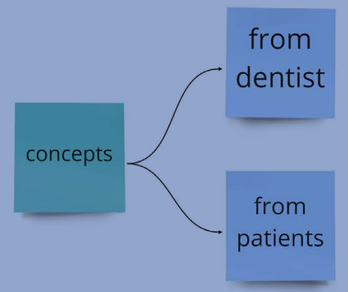

Week 7
Midterm Presentation & Design Directions

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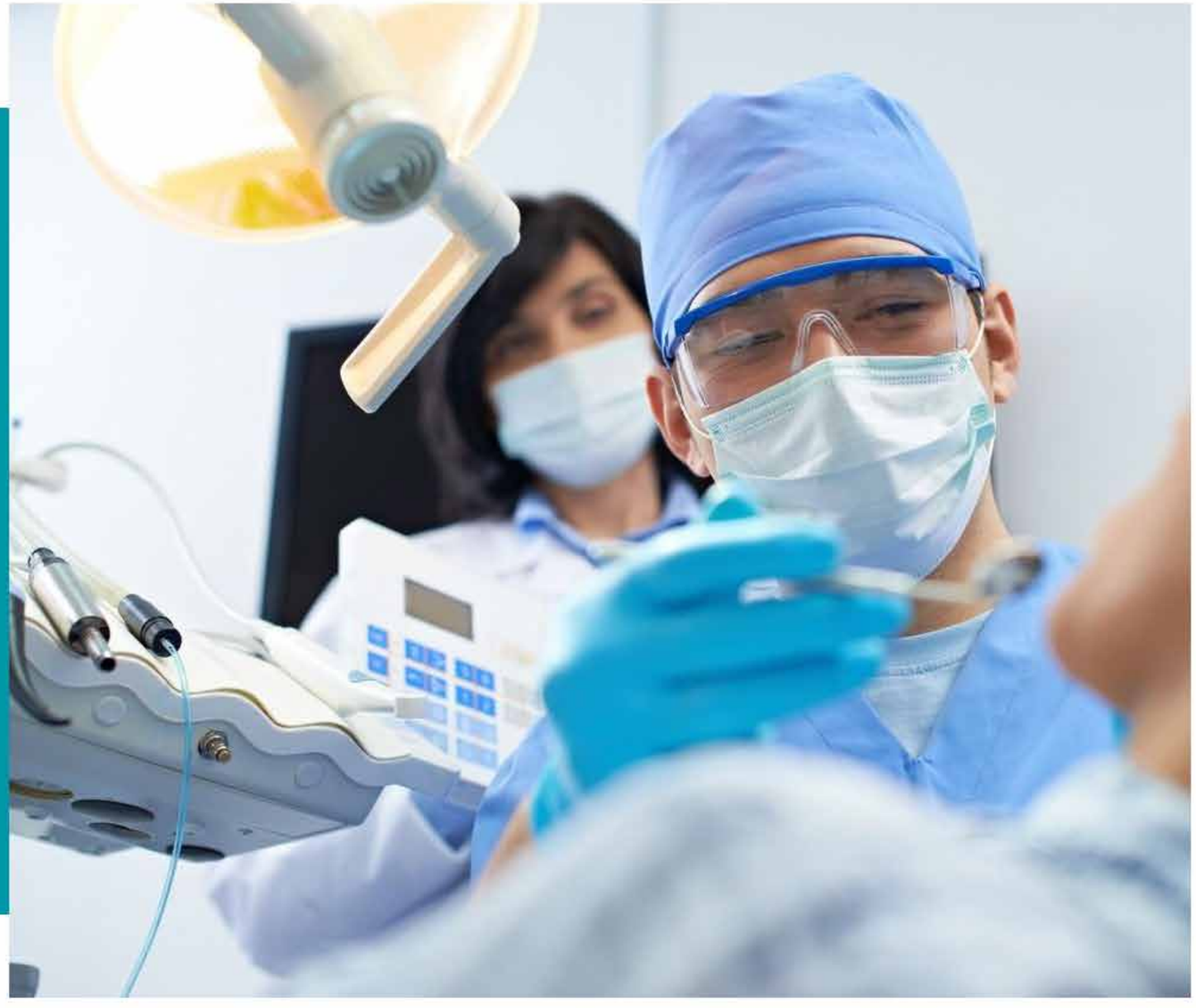
Dental Clinics during COVID-19



The challenges to dental clinics during the pandemic

Team D:
Emma Zhu, Sabrina Xu, Kexuan Dong, Michael Zhu

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Current Situation

As a industry closely related to oral hygiene, dental industry has been dramatically impacted by the COVID-19 pandemic.

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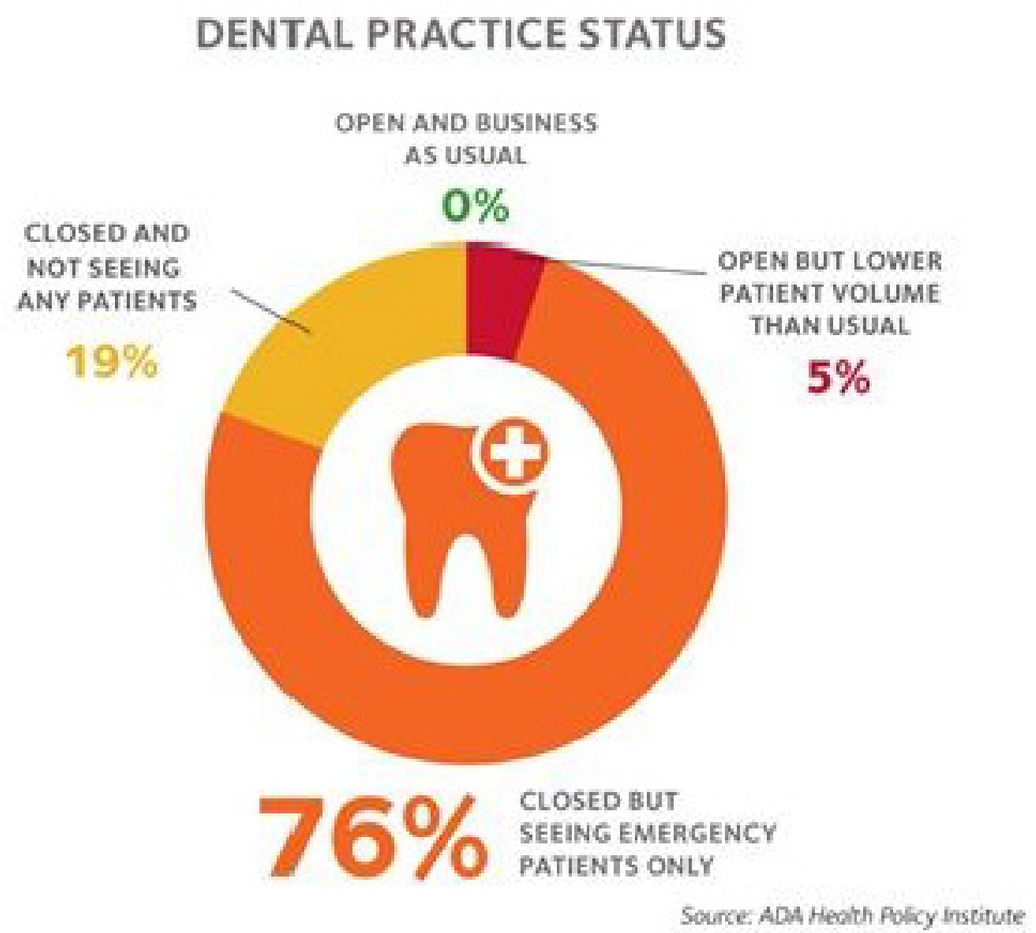
A First Look at Economic Impact of COVID-19 Dental Practices



According to the ADA, **95% of all dental offices opted to close** except for urgent or emergency procedures. It is a critical period of of time for the industry to adjust and evolve for new common with the pandemic.

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Why dental clinics

Necessity:

- Oral hygiene is essential and closely tied to the quality of life

Exposure:

- Dental practices involve close contact to mouths, making dentists and patients vulnerable during treatments

Smaller business:

- Dental clinics are usually smaller in terms of scale and finance, making a pandemic more impactful to dental clinics

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Research Highlights

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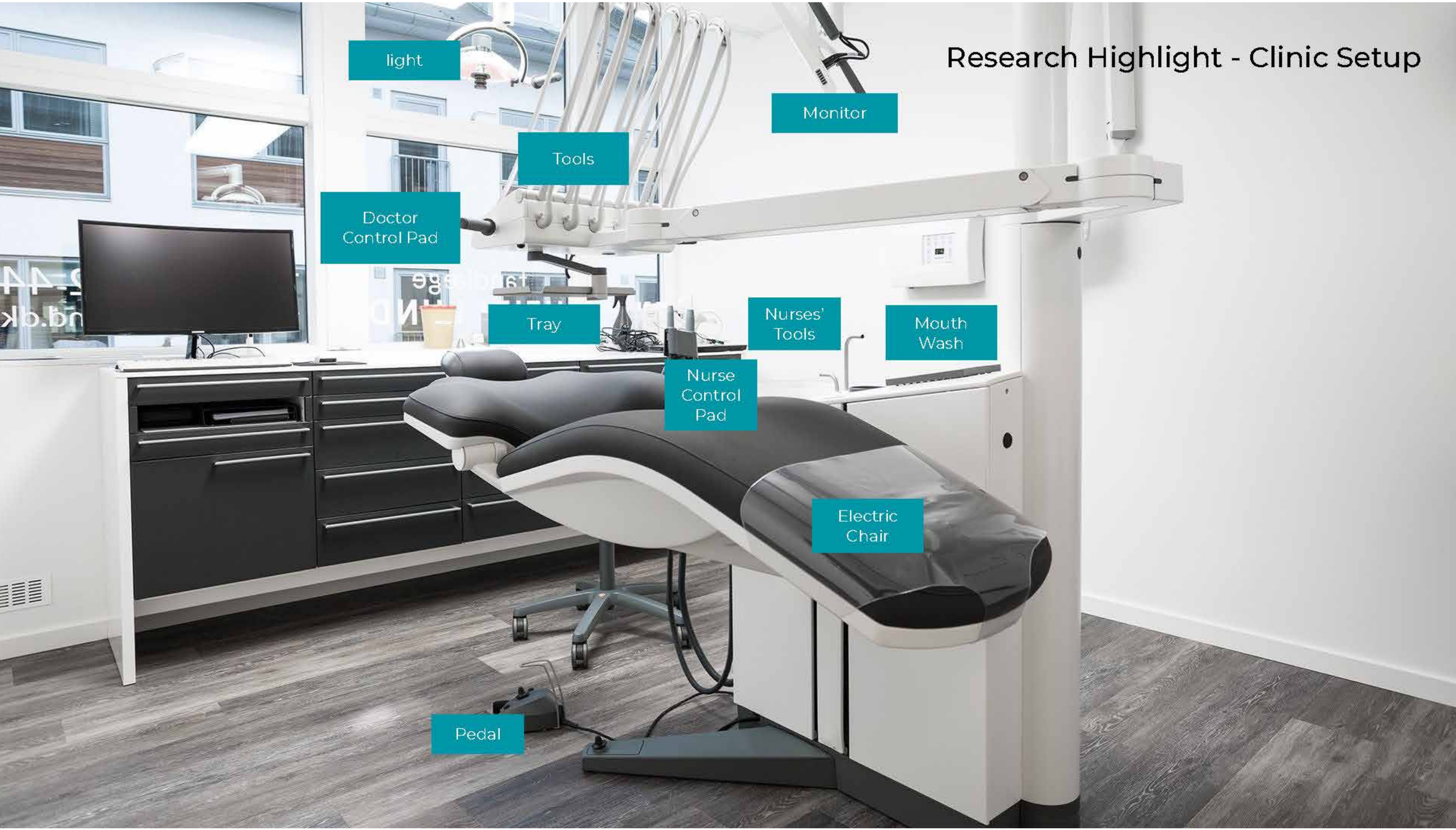
Research Highlight - Clinic Setup



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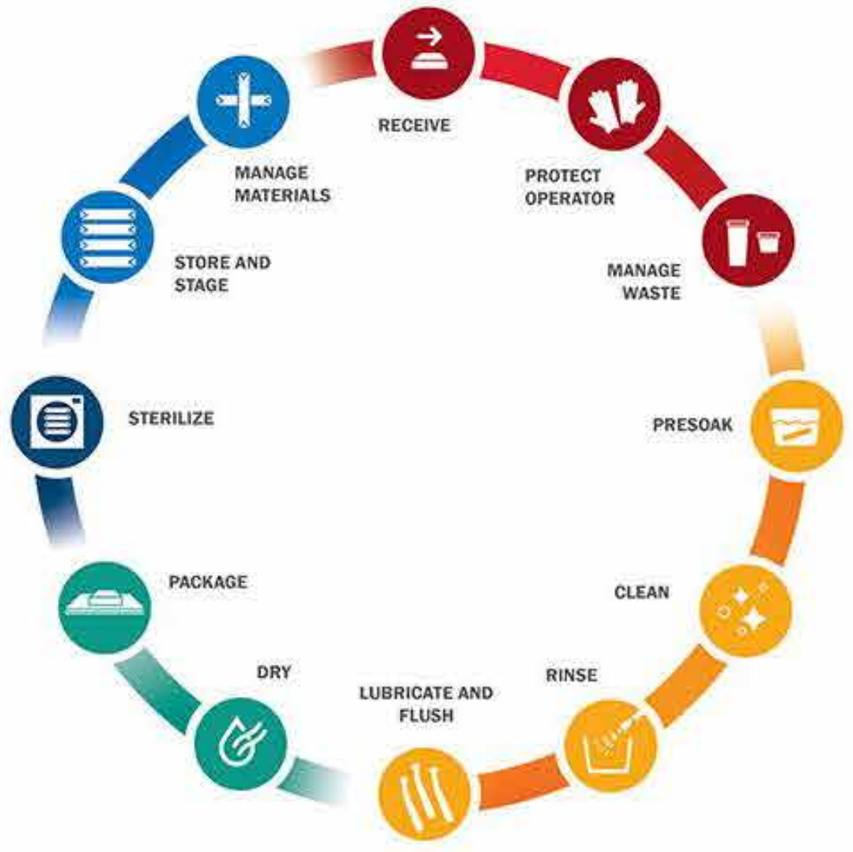
Research Highlight - Sanitation before COVID-19

- Sterilization procedures
- Barrier film/tape
- Change outfits
- Facial masks & gloves



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Research Highlight - Sanitation after COVID-19

- Sterilization procedures
- Barrier film/cloth
- Change outfits
- Facial masks & gloves

+ Check-up before entering
+ Full body PPE
+ Air ventilation
+ UV sterilization

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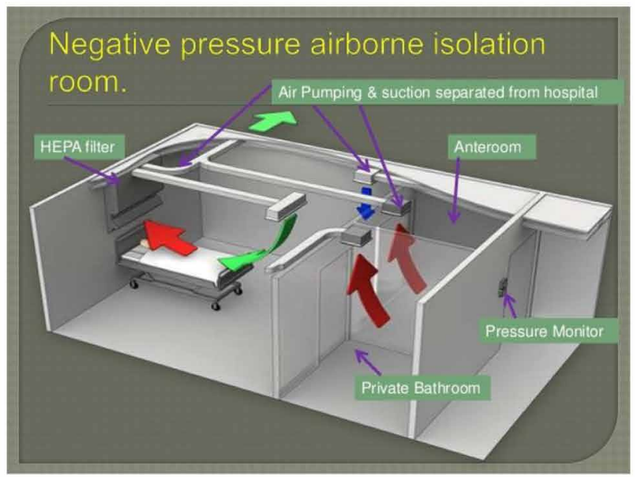
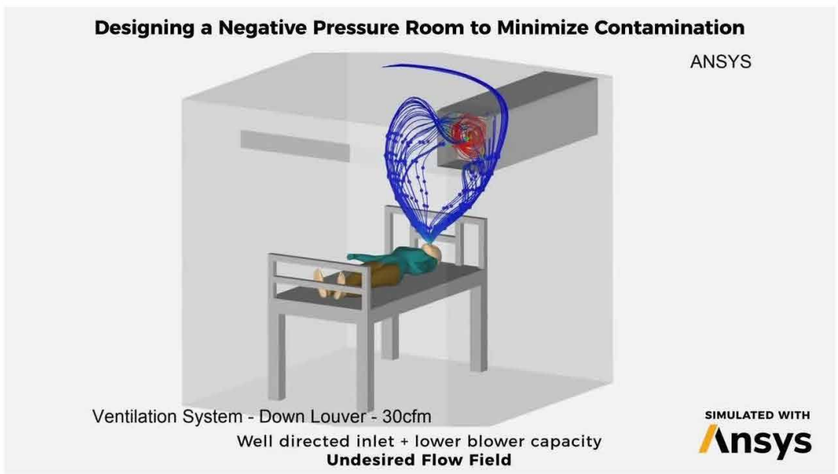
Research Highlight - Technology



Negative air pressure rooms in hospitals



Personal negative air pressure device

Negative air pressure - prevent airborne diseases from escaping the room and infecting other people

- A machine pulls air into the room. Then it filters the air before moving it outside.
- A lower air pressure indoor allows outside air into the room; any air that flows out of the room has to pass through a filter

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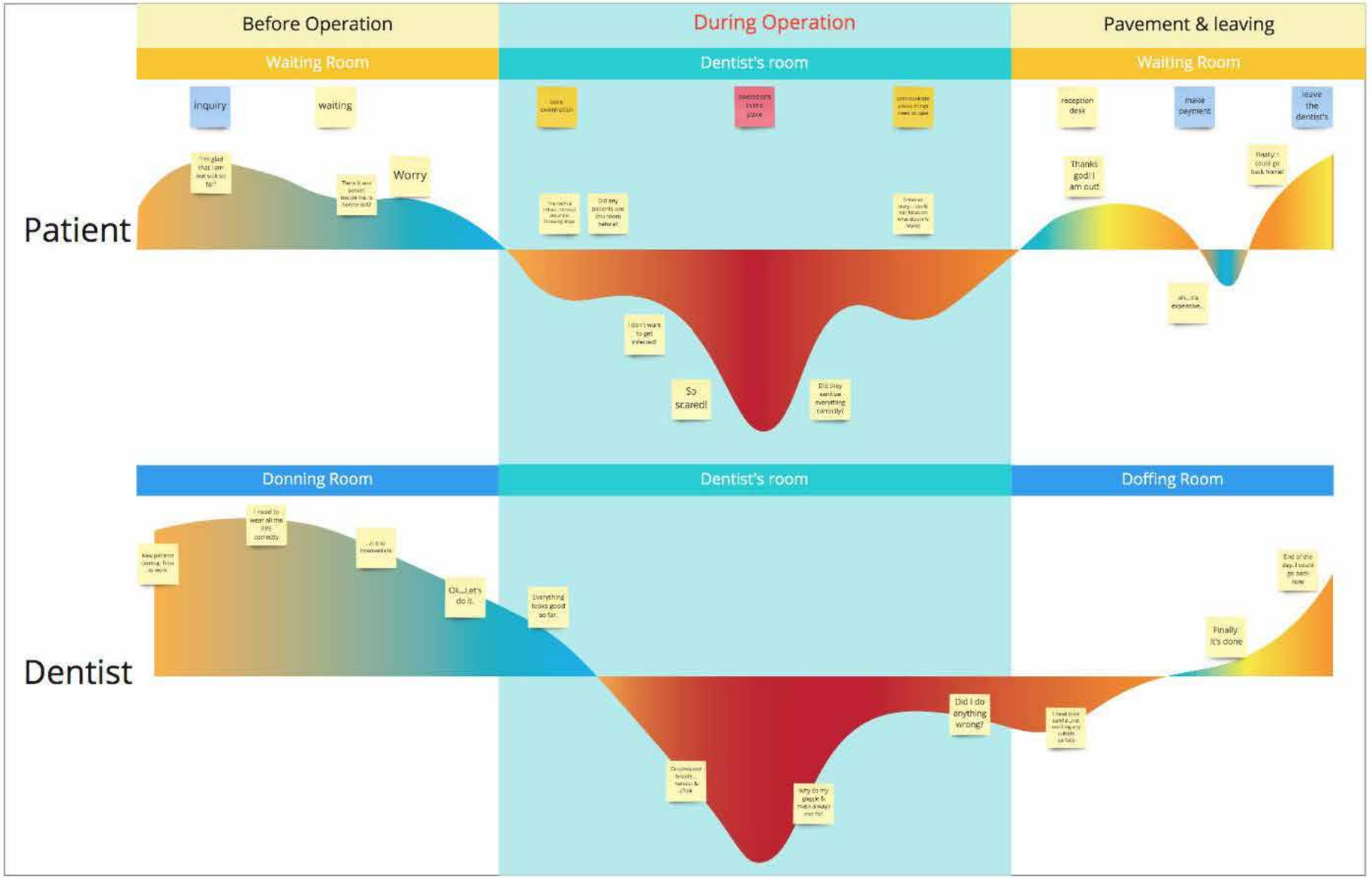
Research Highlight - Emotion study



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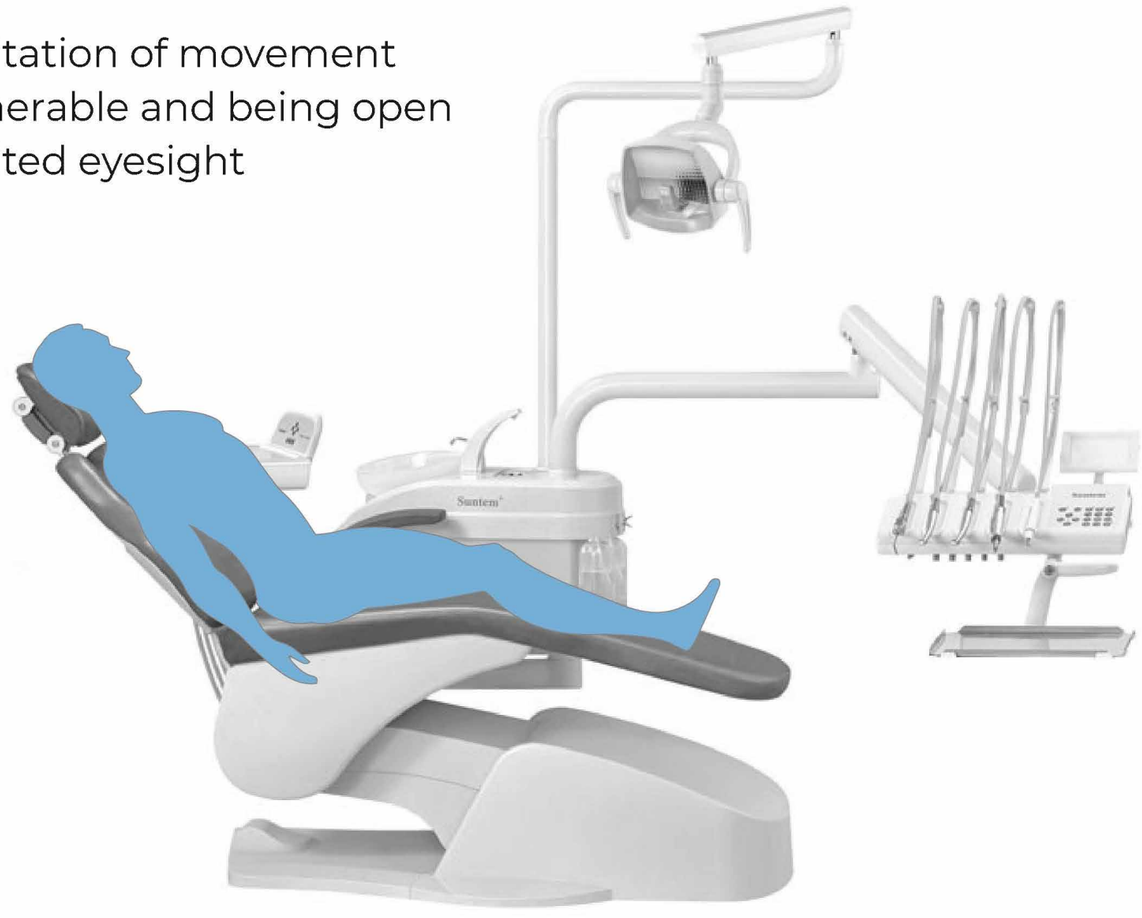
Research Highlight

- Gesture study

- Limitation of movement
- Vulnerable and being open
- Limited eyesight



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Research Highlight - Interview

Name: Allen Mao
Age: 21
Problem: Tooth extraction
Clinic: Century Grove Dental Care

- "I contacted the clinic by texting and making phone calls, **due to the current situation, I had to make multiple phone calls**, and it was annoying."
- "There were **four patients in the waiting room**, including me, and some dentists. Each patient is in an open cell."
- "I was **concerned about the risk of getting COVID**, but I had to face the fact that I must take the treatment."
- "The clinic **did not provide me with any PPE or additional disinfection**."
- "They did not notify me of neither safety concern about Covid-19 nor asked me to make a report to them if I got symptoms in 14 days after treatment."

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Design Approach

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Our Mission

For dentists and patients caring about oral hygiene and facing safety threats of COVID-19, we provide safer solutions and better experience both inside and outside clinics with affordable products and user-friendly system. Help clinics get through this by solving problems in short terms, improving the business model and building trust during the pandemic.

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Goals & Opportunities

Design Goals

- **Safety**
- **User friendly**
- **Trust**
- **Environmentally friendly**
- **Affordability**

Directions

- **Dentist protection**
- **Devices for tools & surface sanitizing**
- **Devices for air circulation & filtering**
- **Prevent the infection between dentists & patients**

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Concepts

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Concept 1 OUTSIDE CLINICS

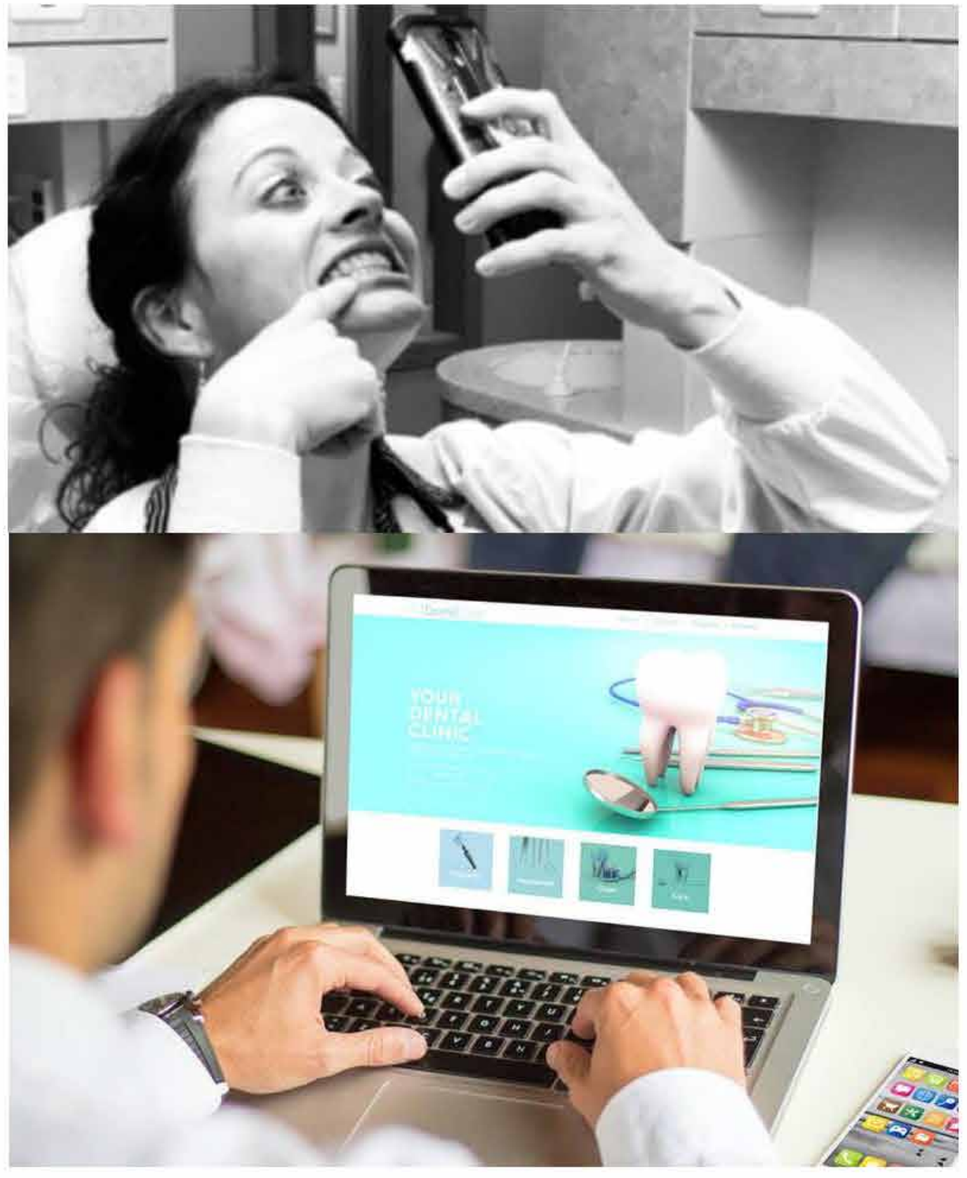
Remote Dental

A platform that extends the dental treatment to provide remote communication between patients and dentists.

This eliminates the non-emergency visit, reduce the risk of contact, while still closely connect patients and dentists, maintaining patients' oral hygiene and dentists' business.

Roll-out timeline:
Short-Term

Product Categories:
Platform
App
UI
UX



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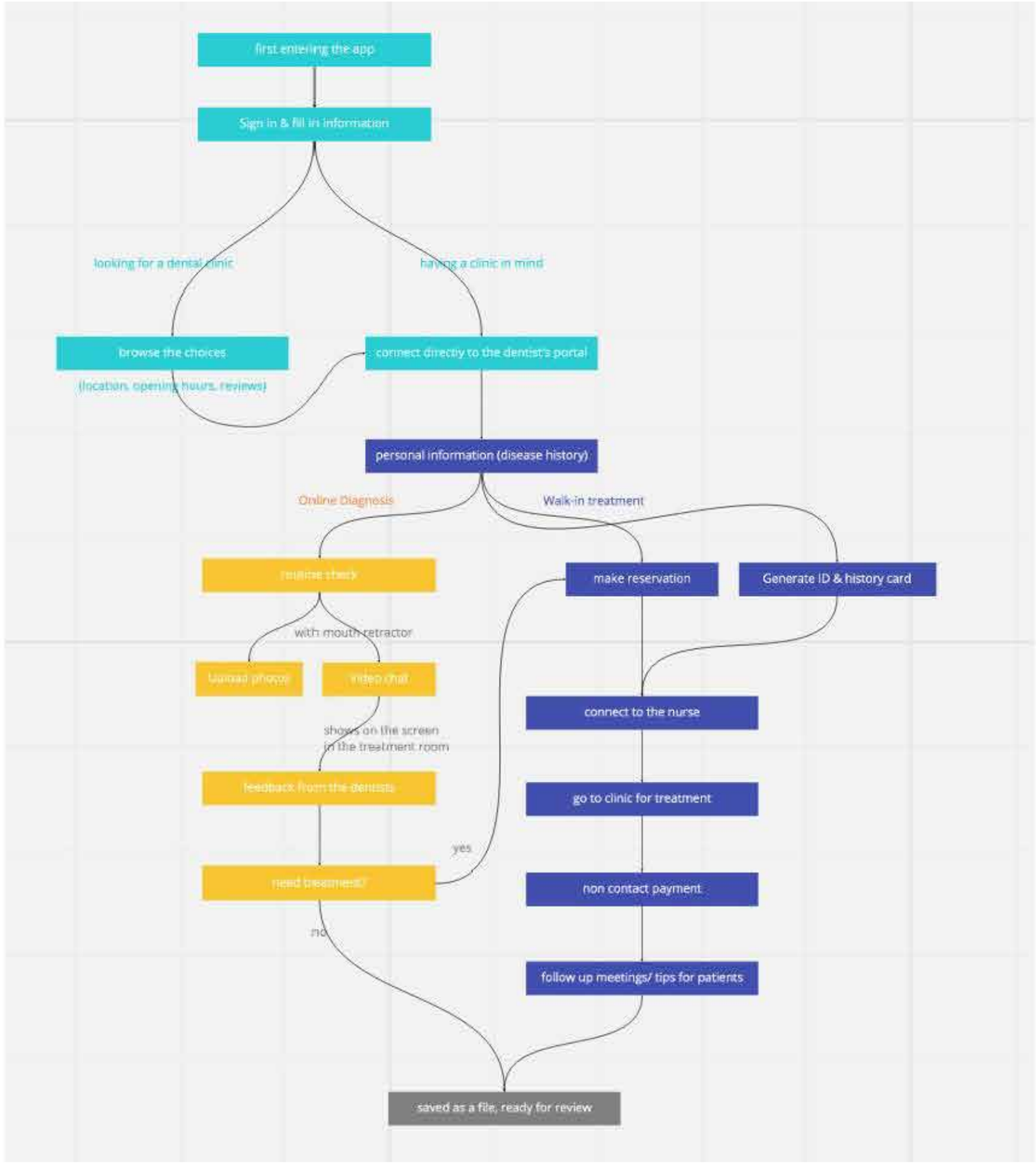
Concept 1 OUTSIDE CLINICS

Remote Dental

BEFORE:
Find dental clinics
Make appointments
Photos/videos for diagnosis
Safety instructions
Insurance/IDs/Medical history

DURING:
Check-in
Data transfer
Patient tracking

AFTER:
Further consultation
Payment
Health tracking
Reviewing and rating
Covid-19 report



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Concept 1 **Remote Dental**

User Scenario

Miranda is having serious tooth pain, but her dental clinic is not in operation due to Covid-19.

She downloads XXX app, fills out basic information and used filters to find the ideal available dentists.

She takes remoting diagnosis followed by the guidance, communicated her symptoms with the dentist through the App.

Miranda successfully makes the appointment, and the system generated her dental ID for faster and more accessible treatment experience.

She presents her digital dental ID to check-in.

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Concept 1 **Remote Dental**

User Scenario

Her dentist knows everything through the system.

She makes the payment on the phone with no contact.

It is a pleasant experience; she rated and left comments on the clinic and dentist.

Eight days later, Covid-19 symptoms appealed to her, Miranda reports her health issue on the App.

The dental clinic receives the emergence Covid-19 report and staffs take the tests soon.

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Concept 2 INSIDE CLINICS

Attachment Devices

Device accessories that improve the sterilization level addressing on air filtration, instant tool sanitization and UV light attachments.

This is an affordable and non-invasive way for dentists to build a cleaner clinic; and for patients to enjoy an efficient and worry-free experience.

Roll-out timeline:
Mid-Term

Product Categories:
Vacuum attachments
Tool sanitizers
UV lights
Surface coverings

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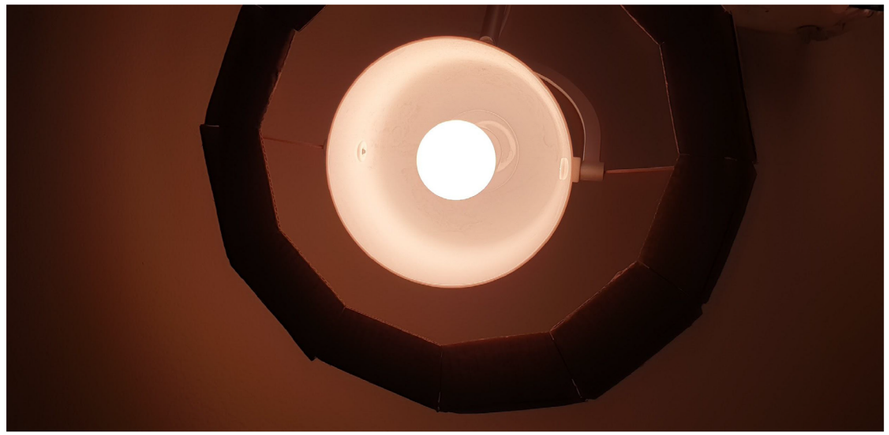
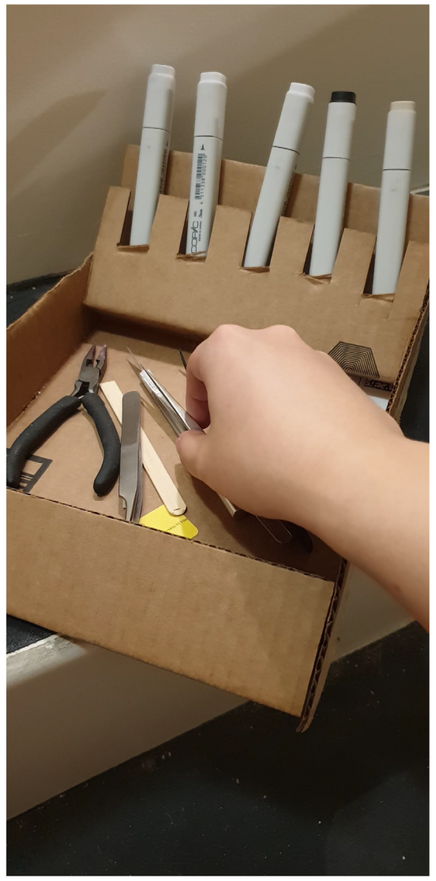
Concept 2 INSIDE CLINICS

Attachment Devices





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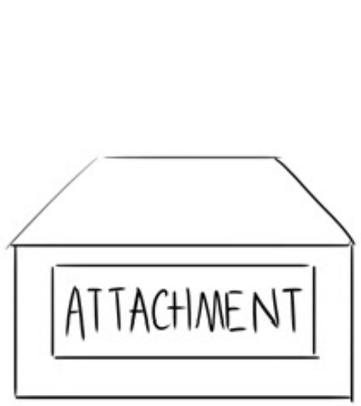
Concept 2 **Attachment Devices**

User Scenario

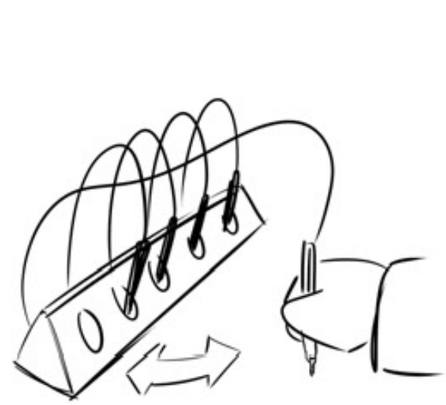


Dentist purchase the attachment set on the company

He install the attachments on to the dental chair with the help of a technician

Before the treatment, nurse selects the essential tools and puts them into the tool box

After patients lied on the dental chair, the nurse turns on the vacuum device for air filtering



The dentist uses the tools during the treatment and puts tools back to the sanitizing box

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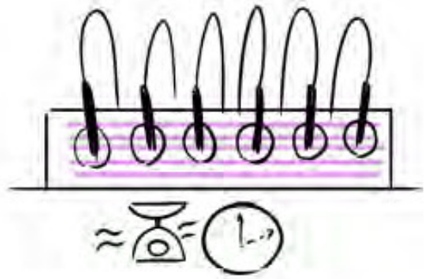
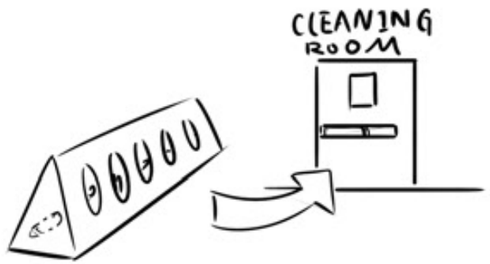
Concept 2 **Attachment Devices**

User Scenario

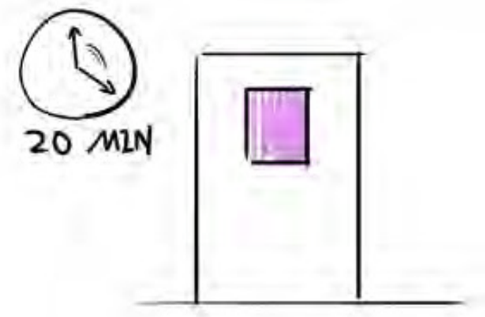


The device is triggered by weight change and automatically sanitize the tools by UV light



After the treatment, the station holding the tools is removed from the tray and sent for further sterilizing in the other cleaning room

Dentist turns on the UV light device when patients left the treatment room



UV light continues to sterilizing the air and surfaces up to 20 minutes and then automatically turns off.

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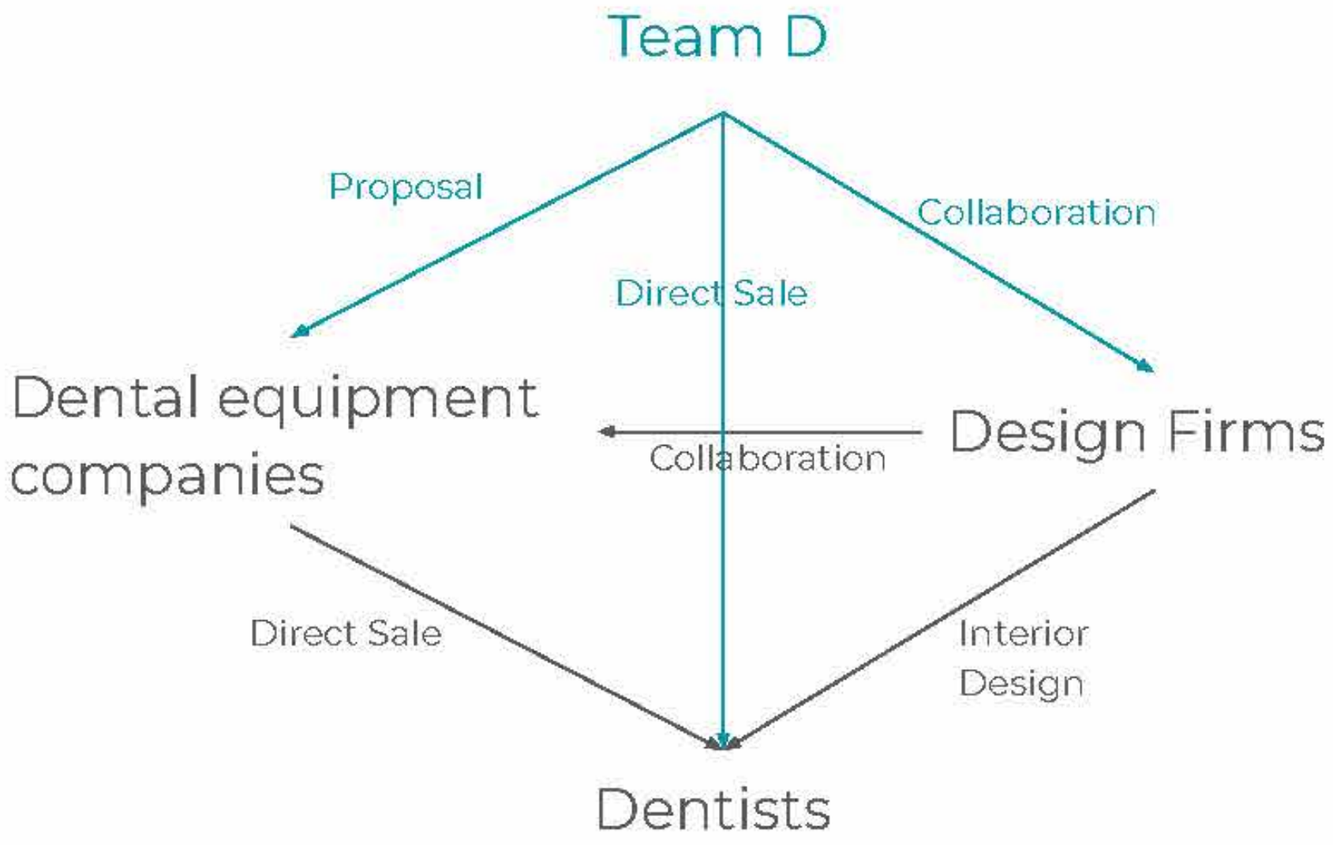
Business Model



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Week 8
Design Direction Refinement & Interviews

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Ecosystem Map

COVID Dental Pack

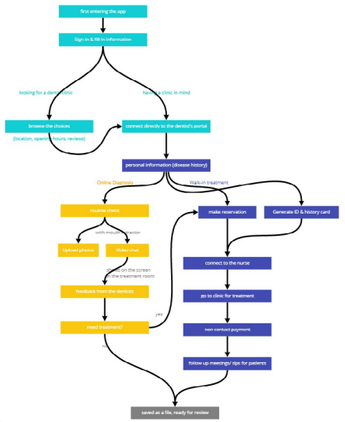
For Patients

For Dentists

Remote Diagnosis System

APP

Search



Online Diagnosis

Reservation

Patient

For clearer image/video

Additional tools

Oral mirror

MINI flashlight

Oral retractor

pre diagnosis for dentists
easier arrangement of reservations based on time for each treatment

Dentist Attachment System

Dentist

Air Vaccum

Mounted on the dental seat
Connected to the vacuum pipe on the side of the seat
Provide air circulation, reduce the risk of infection

Verdict:
This is currently the most solid concept among all three.
Smaller than competitors because there is no power source inside.
Air hose placed in a non-intimidating & ergonomic way.

Tool box

Put on top of the tray
Remains open during treatment, dentists put tools inside
Close the box after treatment
nurse bring the close box to cleaning room
Eliminate the risk of infection during the transport

Verdict:
Easy to transport tools without safety concern.
Could be useful, but doesn't seem unique, just a transport box.

UV light

Mounted on the current light pipe
Remotely turns on after the treatment
Light up the whole room from a high place
UV light on for 20-30 mins (proven to be effective)

Verdict:
Easy to use because of the integration, no need to move in and out
Many competitor UV light units on the market
Doesn't seem unique either, no special feature except the mounting
Could be expensive for dentists to purchase

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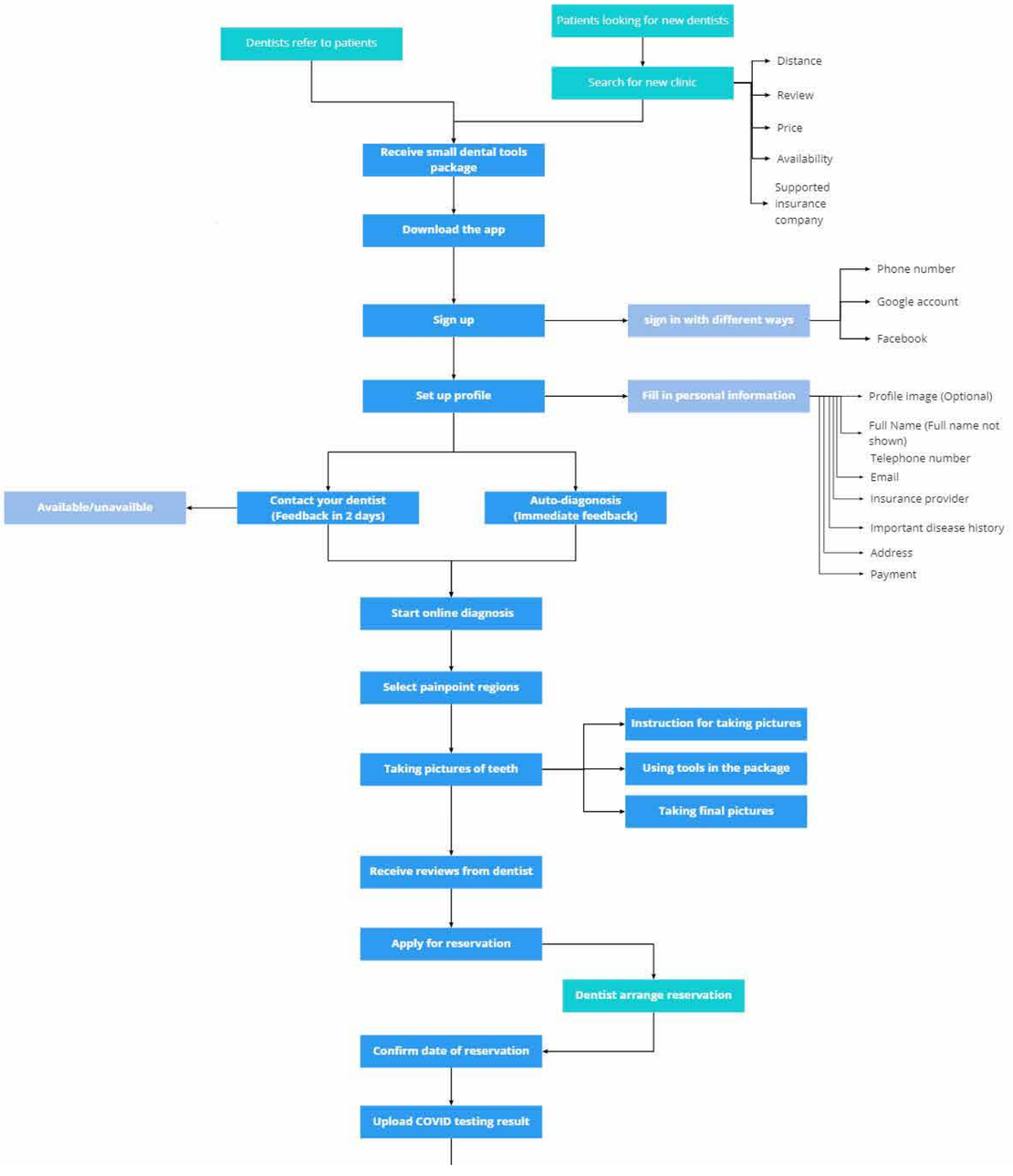
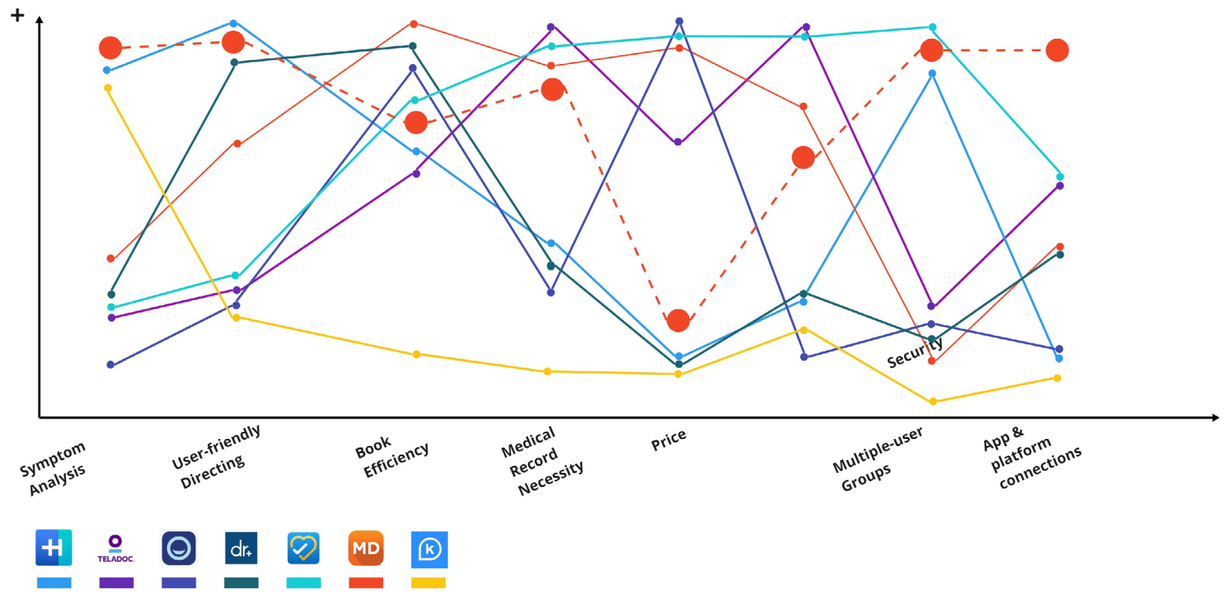
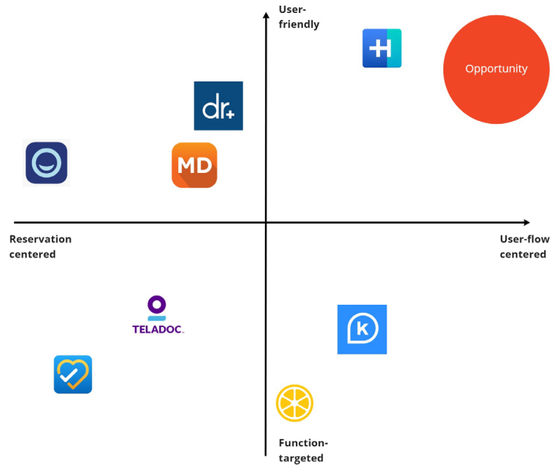
Concept 1: Aero App

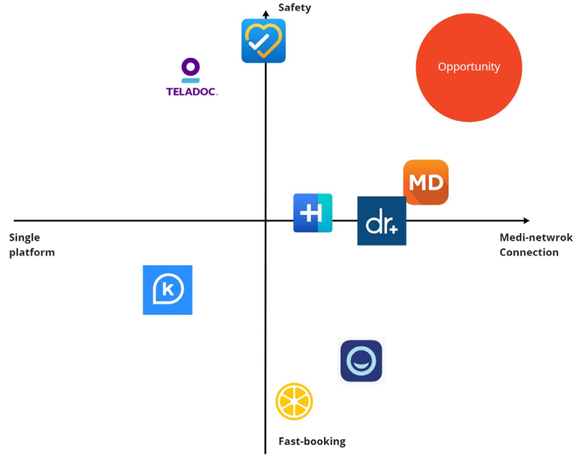
Management app for patients to closely connect with dentists for pre-diagnosis and reservation management.



Strategy Canvas







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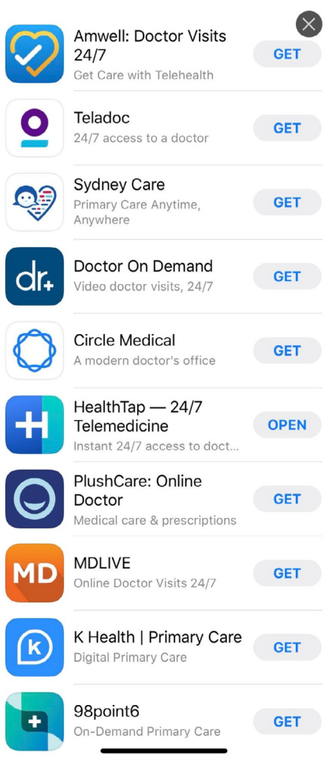
Competitor Research

Top online medical apps



Not reliable providers

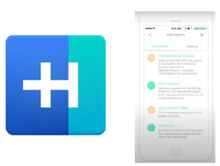
Bad online connecting experience

Doctors hesitate to diagnosis or give presciprtion

No call-back

Discouraging antibiotics

HealthTap



Healthtap----The main service offered by HealthTap is the ability to ask health questions, online and via mobile devices, to a network of U.S.-licensed physicians for free. They also offer the ability to connect immediately or by appointment with a doctor for a consultation via video conference, phone call, or text chat.

Connect patient around the world to reliable doctors and medical resources
Sharing medical cases to millions of patients that have similar symptoms
Fast responding & AI diagnosis
Connect to doctors nearby

For Individuals

For Employees & groups

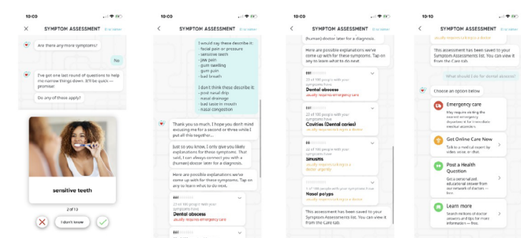
For Doctors & community

No smooth connection/procedure from online asking to physical visits

No access to have reservation with doctors through profiles

Expressive visualization of symptoms

Q&A medical knowledge sharing



TELADOC

is a multinational telemedicine and virtual healthcare company based in the United States. Primary services include telehealth, medical opinions, AI and analytics, and licensable platform services.

Less than $49 or insurance

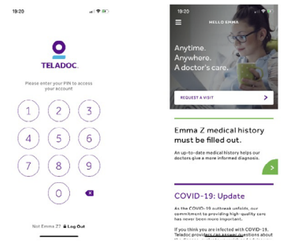
No fast diagnosis for symptom

No Q&A column

Video chat --> prescription to pharmacy

Mandatory medical history

Great security protection



Plushcare

With PlushCare, you can get prescriptions and treatment for a variety of ongoing and non-emergency conditions. Choose an appointment time, plug in any insurance information, and get connected to a doctor — simply and efficiently.

High price

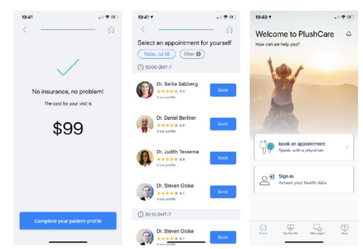
No fast diagnosis for symptom

No Q&A column

For Individuals

Appointment without sign in

Doctor's schedule on profile



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Doctor on demand

Get face to face with a doctor, psychiatrist, or psychologist whether you have insurance or not. The app's providers are licensed physicians, psychiatrists, and psychologists, and they can treat hundreds of issues online through video. Your doctor will take your history and symptoms, perform an exam, and recommend treatment.

No fast diagnosis for symptom

No Q&A column

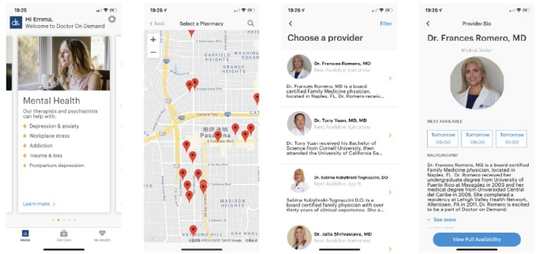
For Individuals

For Employees & groups

Physical & mental care

Map direction

Doctor's schedule on profile



Amwell

[Amwell](#) offers quality medical care on demand. You can schedule appointments, often with next-day availability. Before insurance, Amwell services vary between $69 or less for urgent care — up to $200 for an online psychiatry visit.

No fast diagnosis for symptom

Insurance mandatory

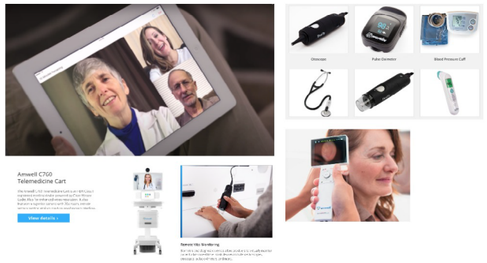
For Individuals

For Doctors & care provider teams

Video meeting with guest/care providers

Translator for doctors & patients

Remote controlled camera for online diagnosis



MDLIVE

Connect to medical and pediatric doctors and access behavioral health therapy services and psychiatry whenever you need it. MDLIVE offers fast, easy, convenient access to a doctor for non-emergency issues when your primary care physician isn't available. Average wait times are under 15 minutes to consult with a state-licensed and board-certified physician.

No fast diagnosis for symptom

Insurance not mandatory

For Individuals

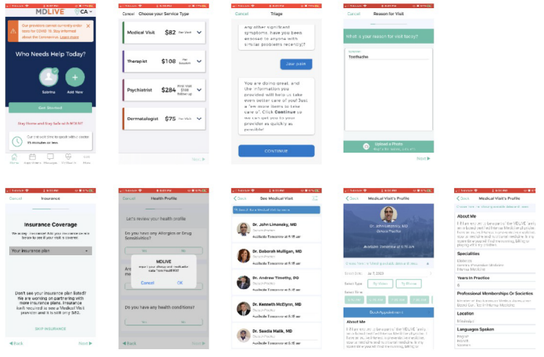
For Doctors & care provider teams

Video/voice meeting with doctor

Doctor speaks different languages

Upload photos for online diagnosis

Able to import information from HealthKit



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Lemonaid

With a $25 doctor consultation and free, fast delivery from the Lemonaid Pharmacy, this app offers a simple way to get a diagnosis and treatment. Just select a service and answer basic health questions. Pay your fee, and you'll get a doctor review within two hours or an immediate video

Mainly not for diseases

It assumes that the patients know their situation

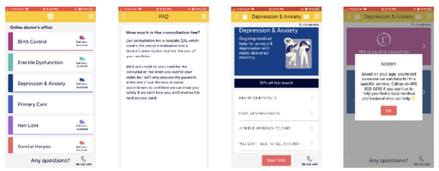
Insurance not mandatory

For Individuals

Mainly through text

Video/voice meeting optional with doctor

Able to continue without creating an account



K health

The internet doesn't understand your personal health, and doctor visits can be expensive and inconvenient.

K uses cutting-edge AI to give you immediate answers you can trust and convenient access to quality primary care in minutes.

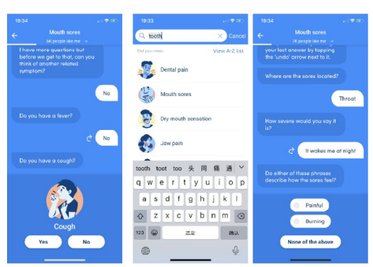
Annoying long time of screening

More like a game than a reliable health provider

For Individuals

Screening tool

Interesting illustration



Dental Shooting

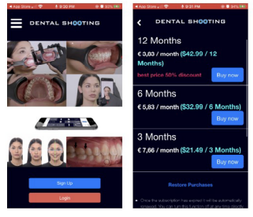
Dental Shooting allows you to take dental images and edit them professionally! After a few minutes you will have a presentation which you can show your patients with possible outcomes.

Tools required

For dentists

Photo documenting tool

Payment required at the beginning



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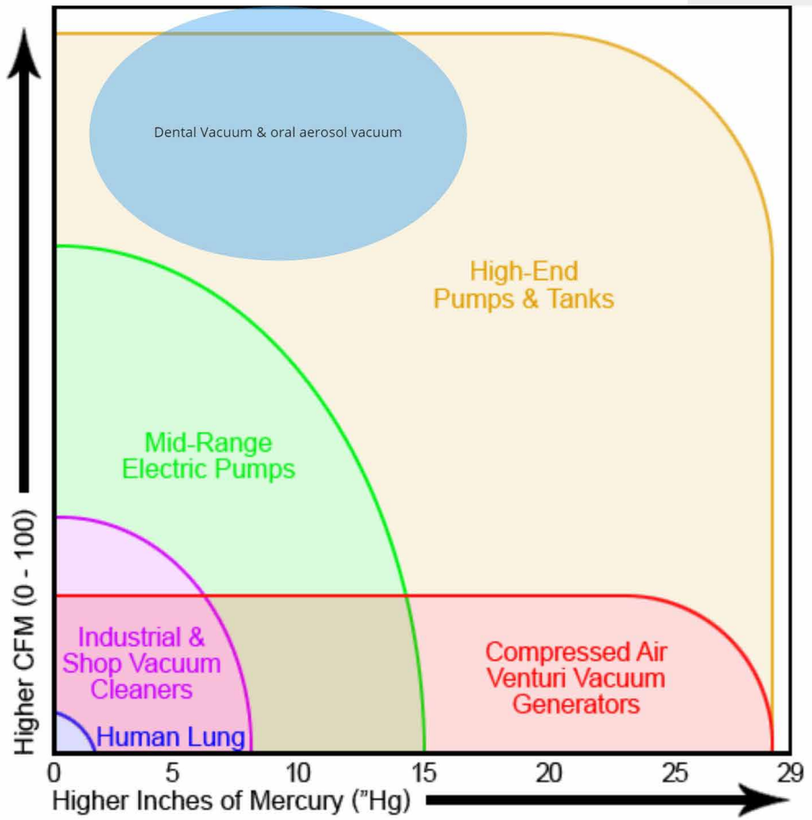
Concept 2: Aero Vacuum

Air vacuum mounted on the dental chair and connected to the central vacuum pump, providing sufficient air circulation with easy installation, small footprint, ergonomic placement and affordable cost.



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INTERVIEWS WITH PROFESSIONALS

Dong Whoon Kim, D.D.S.

Age: 33
Education:
New York University College of Dentistry
University of California, Los Angeles
Work:
Co-owner of DJ Dental Group
ADA, CDA member

"We are **open to all patients** but mostly emergencies"
"Patients **call in the office to make appointments**, my manager answers the phone."
"There's **no remote diagnosis, it is mostly done with X-ray**. We add **extra questionnaire for Covid-19**."

"All rooms are disinfected with alcohol and cavicide, not been used for a while between patients."
"Aerosol vacuum and UV lights are more for the show."
"**Those vacuums on the market are way too big**. Most of dental ops are designed to fit a chair, cabinets and 3 people (doc, assistant and patient.)
Most of my friends **have hard time figuring out where to put that big standing vacuum**. And it's way too **noisy**.

Scott Jeon, D.D.S.
Age: 28
Work:
Pacific Dental Care
Education:
University of Florida B.S. Biology
Universityof Southern California school of Dentistry

"**The front office handles appointments**. I don't talk to patients before making appointments."

"All of the **extra PPE makes it hard to work, hard to breathe.**"
"We don't use aerosol vacuum but I with the owner would invest in one. It is just **too pricy**."
"Assistants wipe everything down with disinfectant cave wipe and replace tape. **People don't see it**."

Dee Xia, Junior Dentistry Student
Age: 25
Work:
UCLA college dental clinic
Education:
University of California, Los Angeles

"We provide **simple pre-diagnosis to patients through phone calls**"
"The front office answers phone calls. But if the patients have some questions after treatment, they could contact us directly. **Some dentists have business numbers but I'm just giving my personal number for now.**"
"We **only accept emergency cases**."
"There is **questionnaire** about COVID symptoms released by CDA, most clinics are following that standard."

"My **biggest fear is the aerosol producing** during procedures."
"**The assistant is required for aerosol producing procedures.**"

Platform (App)

Product (Vacuum)

DESIGN INSIGHTS:

Availability	See whether your case is accepted by clinics
Easy Appointment	Easier reach-out to clinics and management of appointments, reduced workload for managers / reduced amount of managers?
Remote Diagnosis	As an optional complementary tool for pre-check, reducing unnecessary visit to clinics
Less Contact	Less phone calls and less assistance, the App would replace as much face-to-face guidance as possible through the whole process
Digital Questionnaires	Fill out the COVID questionnaire on your phone before entering the clinic, save time and save paper!
Dentists Contact	Let patients text/call dentists through "virtual numbers" during available hours, protecting everyone's privacy and making communication more efficient

Smaller	Reduce the scale of the machine, make it attachable to the dental chair set
Quieter	Reduce the operation noise
Affordable	Reduce the cost by addressing multiple design solutions
Transparency	Reduce patients' fear by making disinfection "visible"

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Week 9
Scenarios User Flow & Form Development

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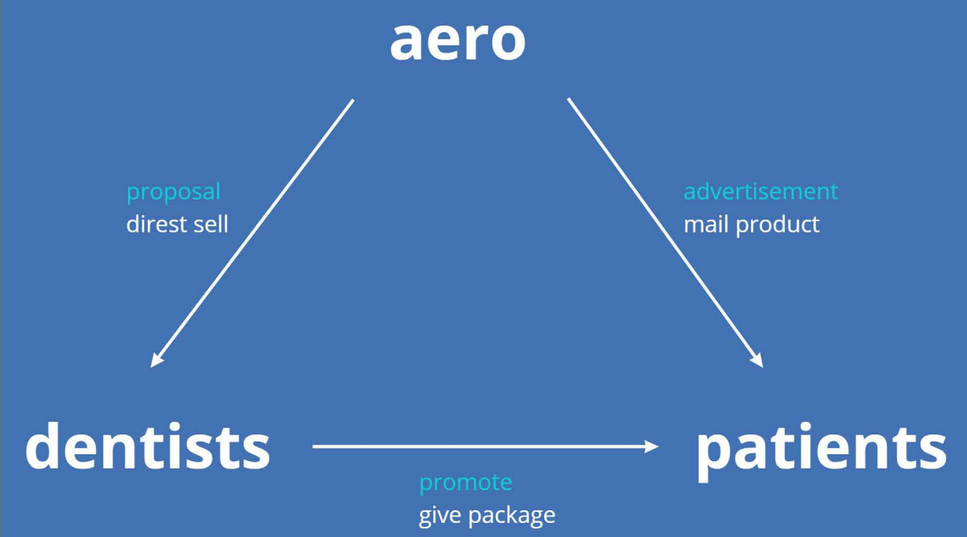
"Connect without Contact"

Aero offers supportive product and software for dental clinics to maintain the trust and connection to their clients during the period of pandemic.

Delivering Piece of Mind to patients
- seperating, educating & notifying

- Avoid contact by online diagnosis for routine check
- Show clinic's cleaning & qualified level & reviews
- Educate patients with COVID-19 instructions & sterilizing standards
- Make patients wait outside of clinic & separated from each other
- Visualize the sterilizing process while waiting
- Test aerosol density in air (represent air quality)



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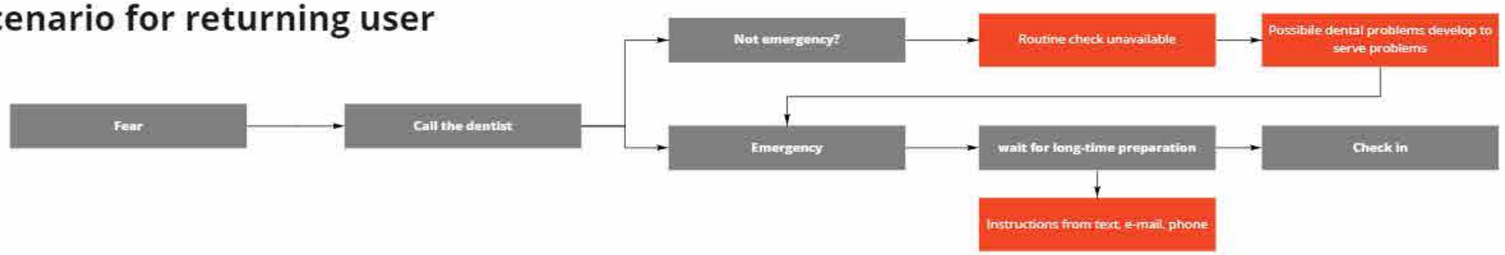
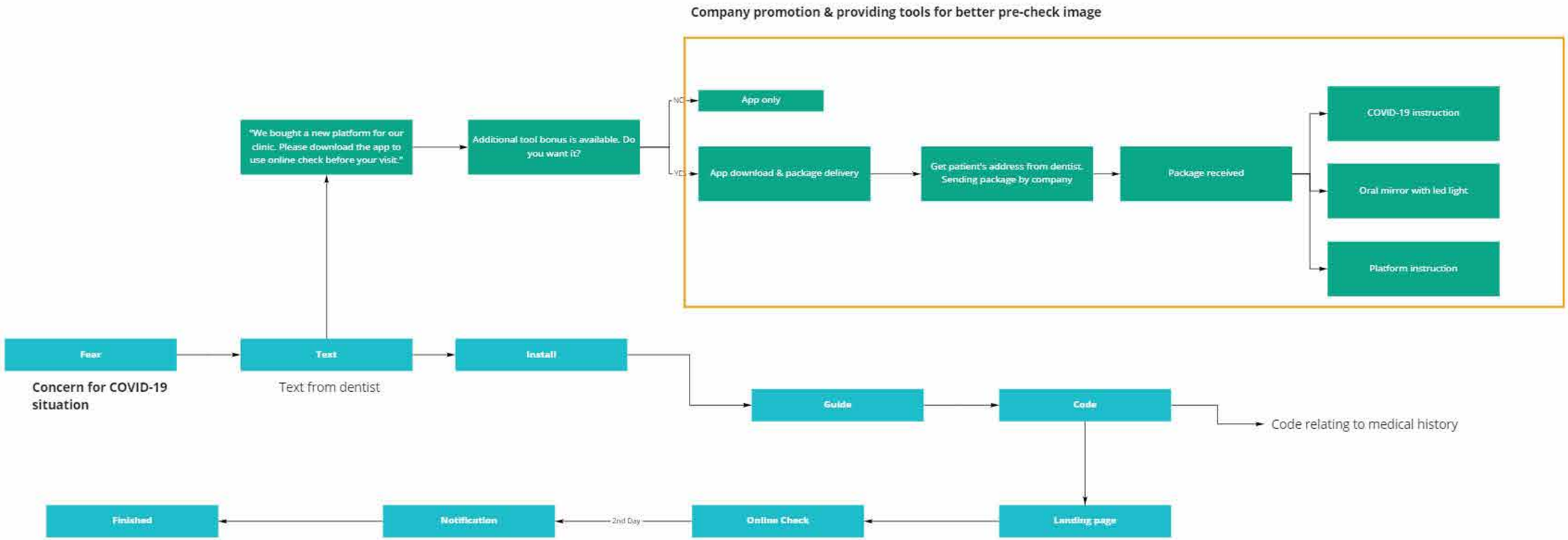
Scenario for returning user





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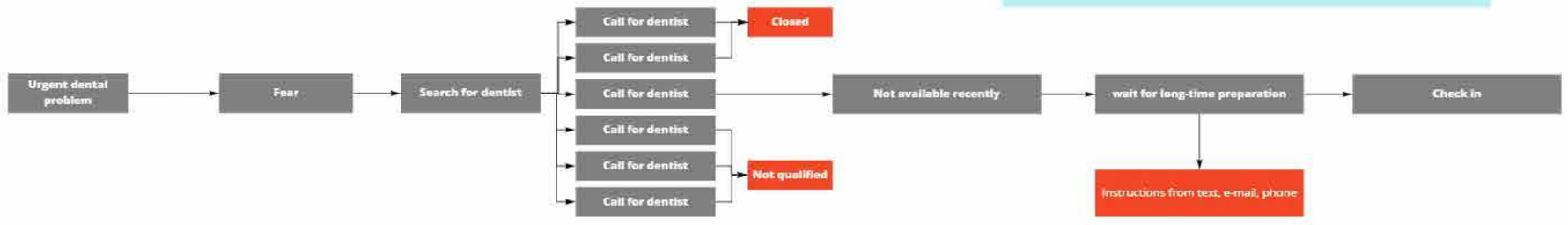
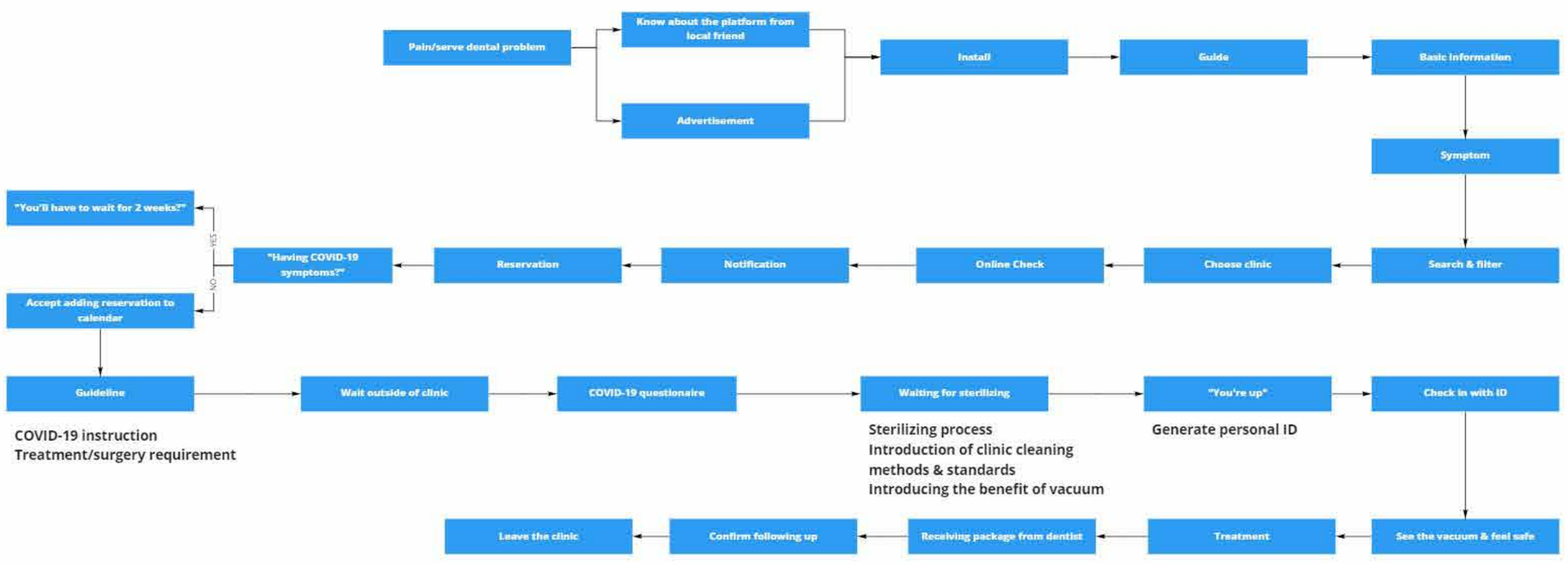
Scenario for first-time user



www.dentaleconomics.com

StackPath

Statistics tell us that the average practice may lose as much as 10% of its patient base through normal attrition. We recommend that the practice set a goal of 15% growth in order to achieve actual growth. If your practice accepts any discount type of plans you should track the breakdown of those plans vs. fee-for-service.



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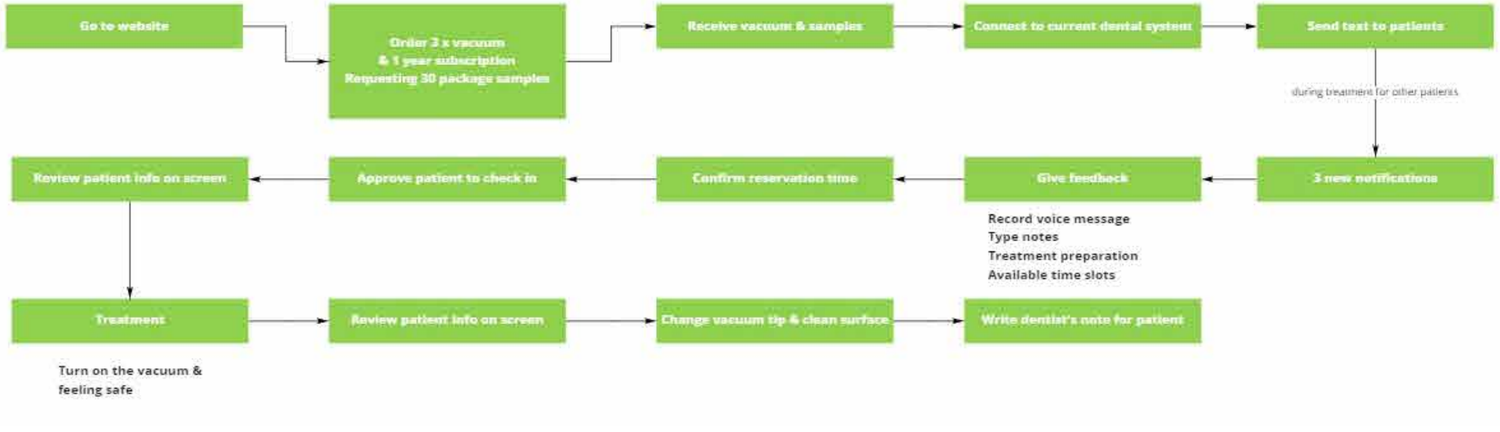
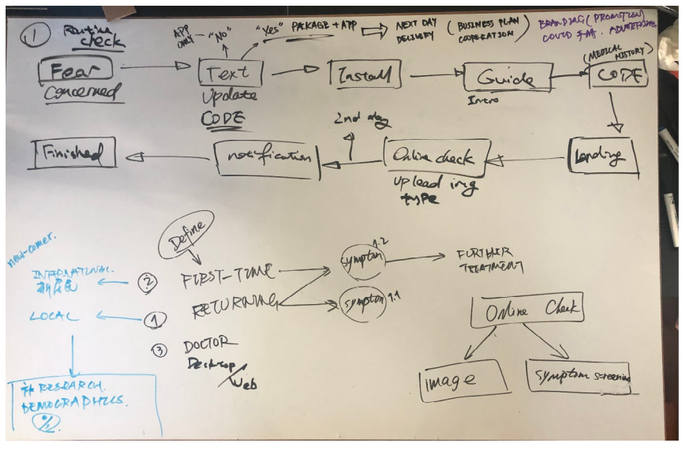
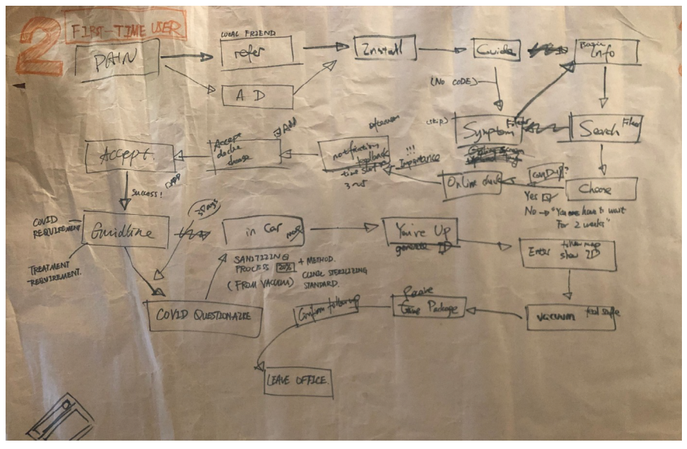
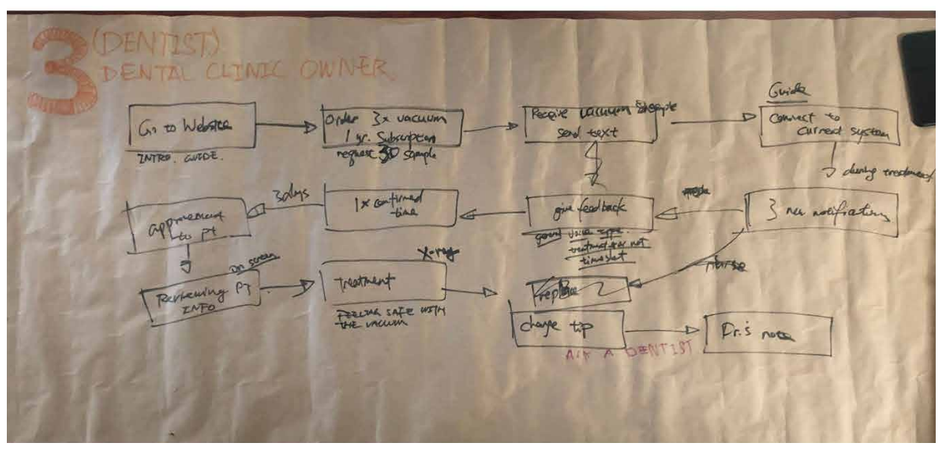
Scenario for dentist









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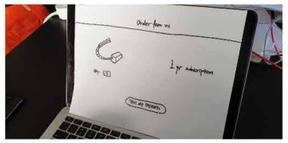
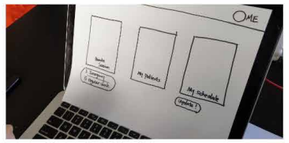
Scenario 1: Dentist

The dentist is browsing website

She sees the aero page and she is interested in aero's product and service



She orders three vacuum and one year digital subscription. She sends texts to her current clients to tell them about the update, and she also requests some package samples to keep in the clinic

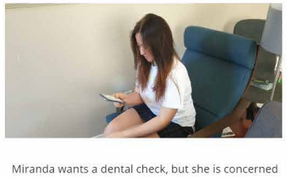


At the end of the day, she looks at the app and notices several new messages.

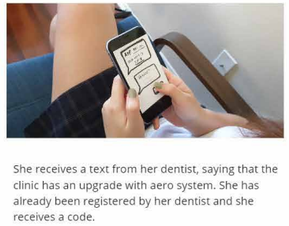
She opens them and type her feedback. Looks like two of them need to come to the clinic for further treatment, so she sends her available times for patients to select.

During treatment, she is able to pull out the record of her previous feedback.

Scenario 2: Returning Customer

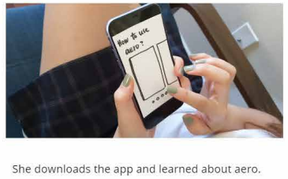


Miranda wants a dental check, but she is concerned about her clinic's safety

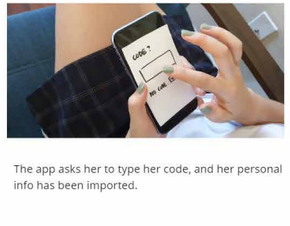


She receives a text from her dentist, saying that the clinic has an upgrade with aero system. She has already been registered by her dentist and she receives a code.

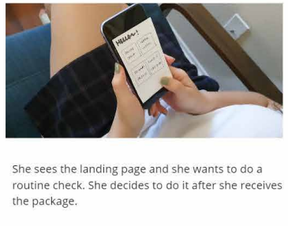
There is also an option for her to receive a package to help her connect remotely, she clicks yes.



She downloads the app and learned about aero.



The app asks her to type her code, and her personal info has been imported.



She sees the landing page and she wants to do a routine check. She decides to do it after she receives the package.

Next day, she has a delivery.

It's the assistive package ordered by the dentist and shipped by aero

It's the aero package, she opens it up.

She takes out several tools for dental checking

In her app, she first follows the instruction to type in her requests

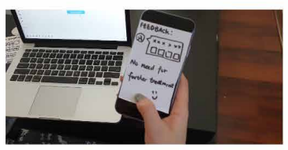
The she follows the instruction on the phone, puts oral mirror in her mouth and takes a picture.

The picture shows some details of different regions of her teeth.

She finishes up the message and send it to her dentist.

Next day, aero sends her a notification.

She grabs the phone and sees her dentist's feedback.



Her dentist thinks that she doesn't need treatment in the clinic, she just needs to brush her teeth well. She feels relieved that she doesn't need to go to the clinic.

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Scenario 3: First-time Customer

Mary is having a toothache. But as a newcomer, she doesn't have a dentist in mind.

Being referred by a friend, Mary downloads the aero app to look for her new dentist.

She looks through the guidance to learn about the app

She skips the step of typing the code, because she doesn't have one.

She puts in her personal info to create an account

She sees the landing page and she wants to send a treatment request.

First, the app asks Mary about her general symptom, this is to help aero find the proper dental clinic.

She looks up the nearby dental clinics equipped with aero system.

As a new patient, she has to do online check first for dentist to know about her basic oral condition. Once she selects her clinic and her dentist, she starts typing the pain region and other details.

Mary also takes a photo with her phones and upload to aero.

The picture is not high-quality but it will do for now.

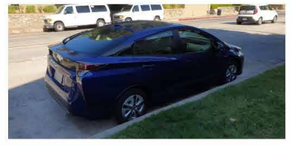
She finishes up the message and sends it to her dentist. She wants the dentist to reply fast so she adjusts the level of inportance.

In the afternoon, she receives the feedback. Her dentist thinks that she does need to go to the clinic, and her dentist gives her three options.

She selects one that fits her timeframe and add it to her calendar.

The app tells her the guidance of visiting during covid-19

She completes the survey about covid-19 symptoms, she doesn't have symptoms so she is clear to go.



On the treatment day, Mary arrives early and waits in her car.

She opens the app and starts the check-in process.

Mary confirms again that she doesn't have covid-19 symptoms

Now Mary can see the room she is about to go in. She sees that the room is being cleaned thoroughly.

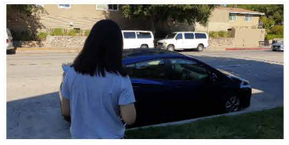
She learns that the built-in sensor of the vacuum is monitoring aerosol droplets in the air, and she doesn't feels concerned about the safety.

When she is up, the app generates a QR code for check-in.

She goes to the clinic knowing that the room is fully cleaned.

The aero vacuum protects Mary from cross infection. She feels safe during the treatment

After the treatment her dentist gives her a package, this is to help her with follow-ups in the future.

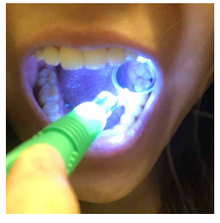


After treatment, Mary returns to her car.

She opens the aero app again to confirm her next appointment.

She notices that her next schedule has already been updated with time and treatment details.

She feels very relieved that aero system is protecting her with streamline process and reliable products.



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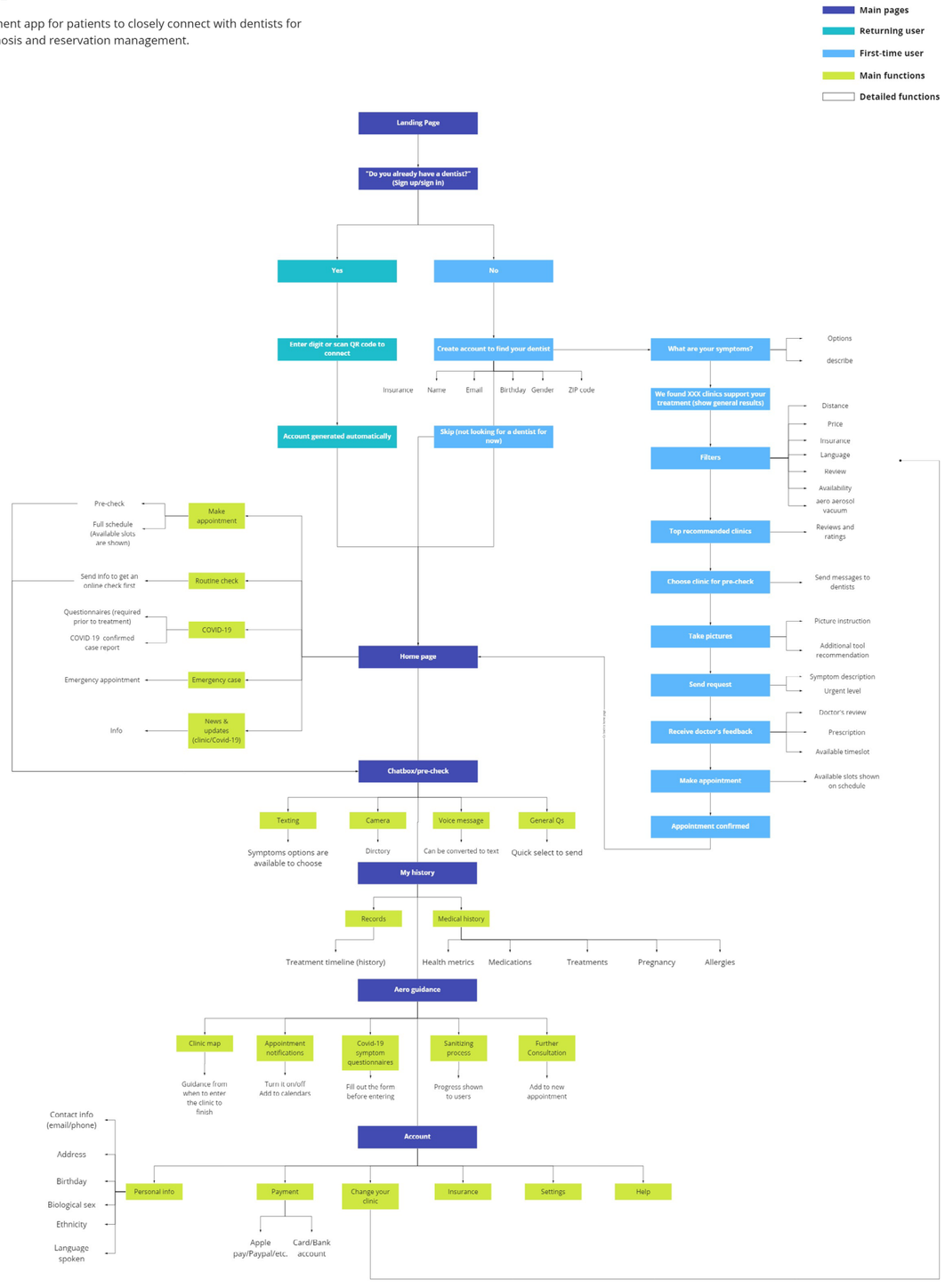
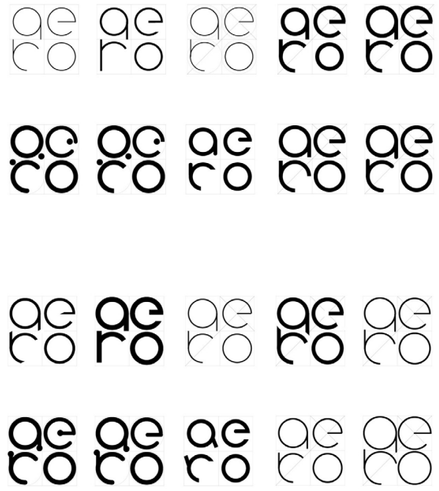
App Flowchart

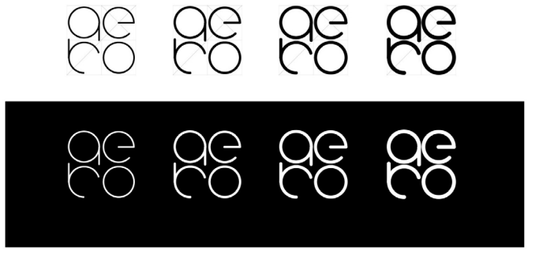
Management app for patients to closely connect with dentists for pre-diagnosis and reservation management.



Logo Development

- "Connect without Contact"
  Connecting 4 letters with continuous design language without making contact between each other
- Mouth
- United
  Creating a united platform for dental community





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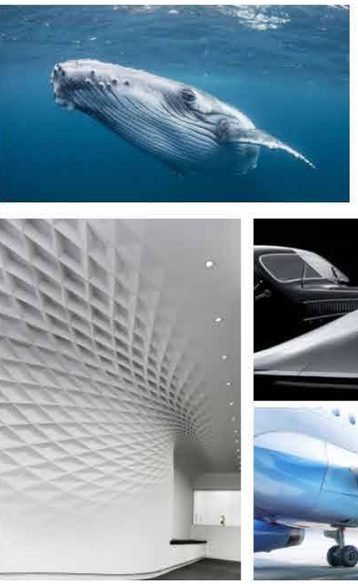
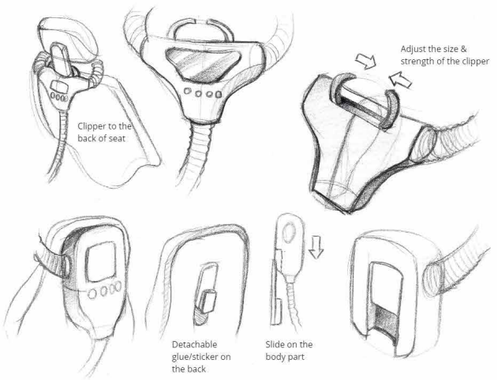
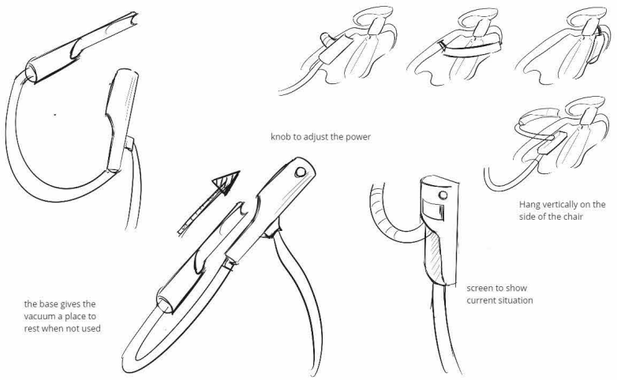
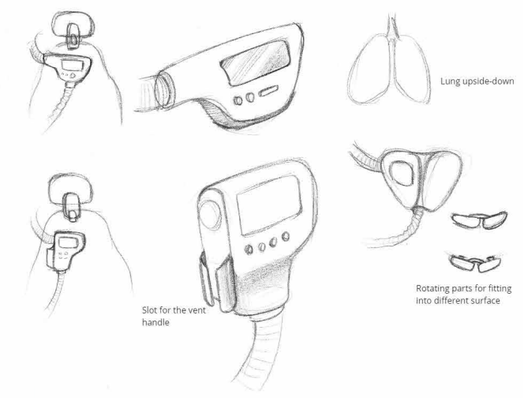
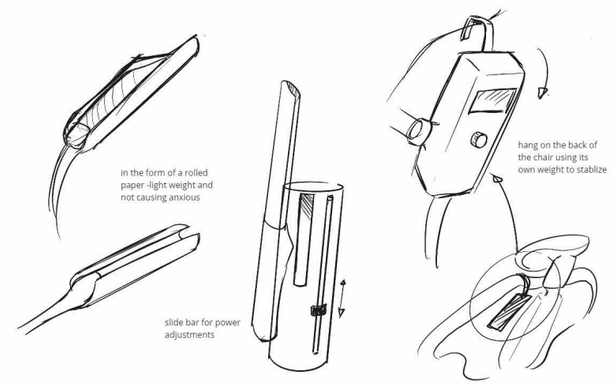


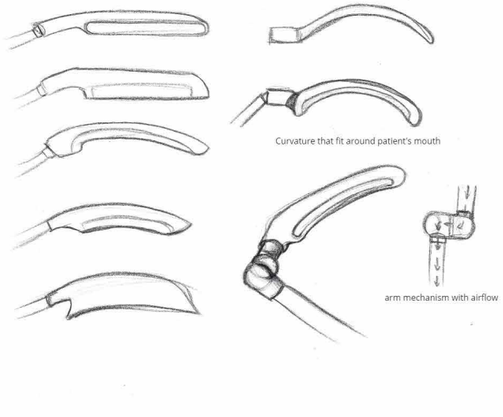
Aero Vacuum

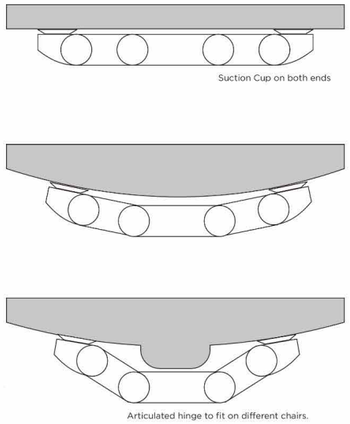












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Week 10
Form Development & CMF

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Top 10 popular dental chairs

- Thin connection structure from neck to back
- Curved/ organic surface on the back of the seat

DentalEZ AXCS Chair

Takara Belmont Quolis Q-5000 Chair

A-Dec 500 Dental Chair

Pelton & Crane Spirit 3300 Dental Chair

Marus NuStar SII Dental Chair

TPC Mirage Hydraulic Patient Chair

Midmark Elevance Chair

DCI Series 5 Chair

Summit Dental Systems Palm Beach Chair

TechnoDent 2009new Dental Chair

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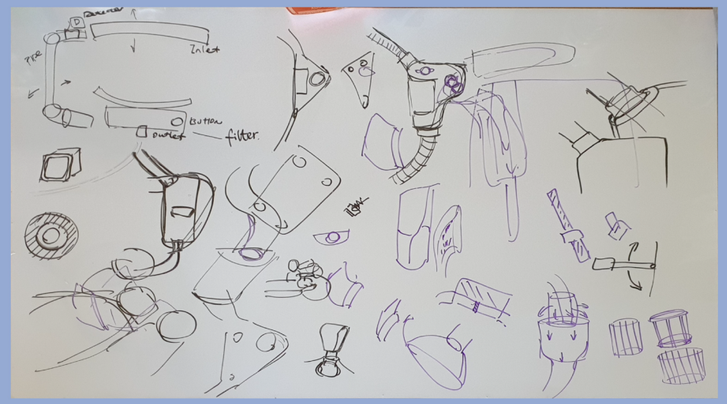
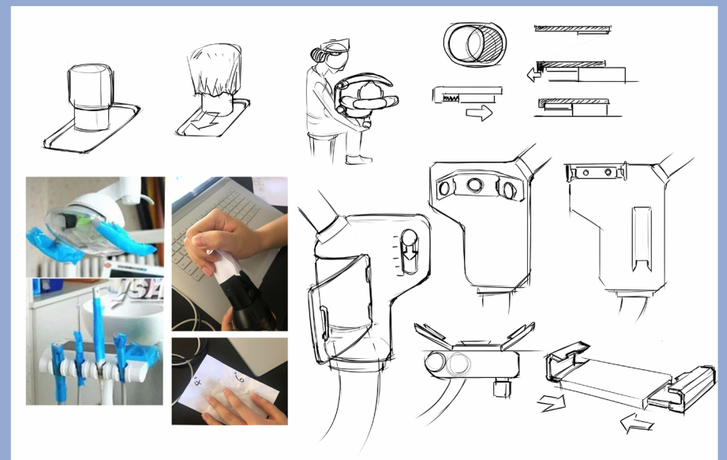
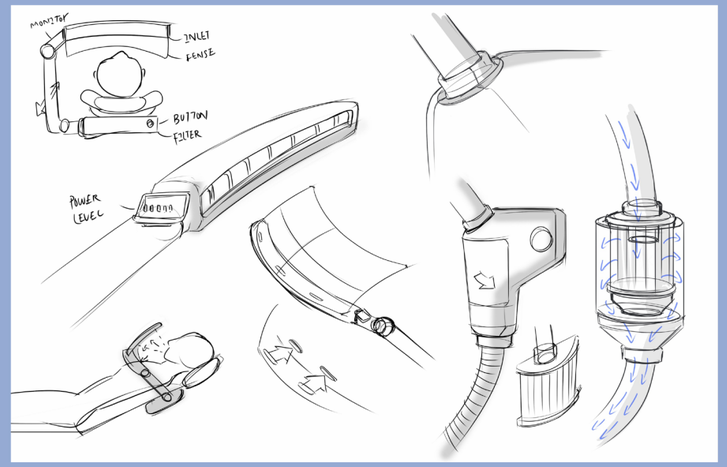
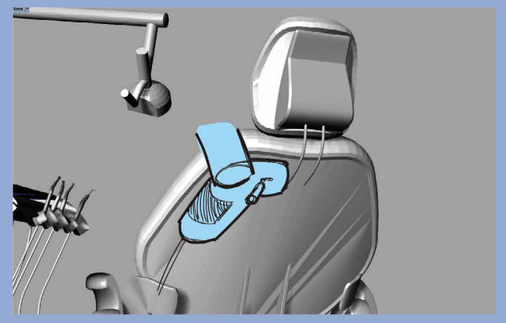
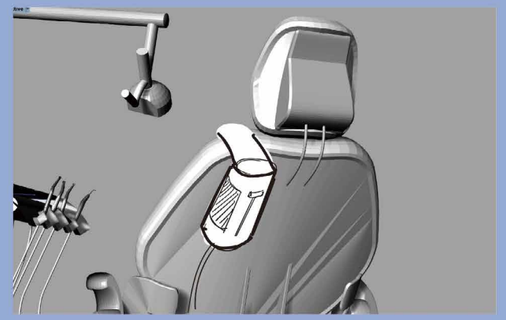
aero

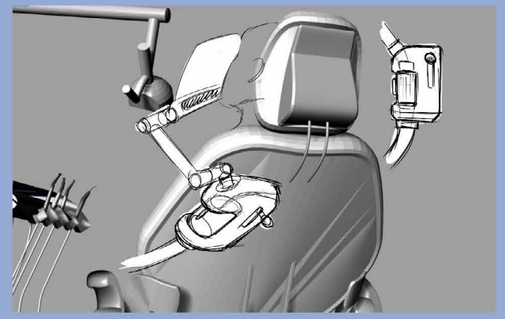


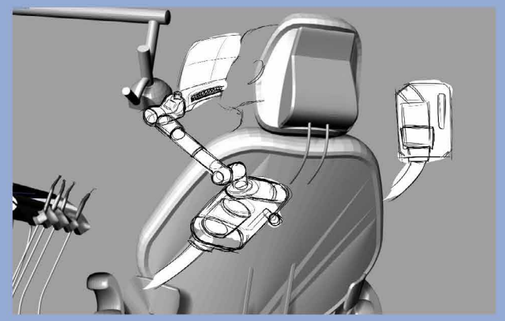


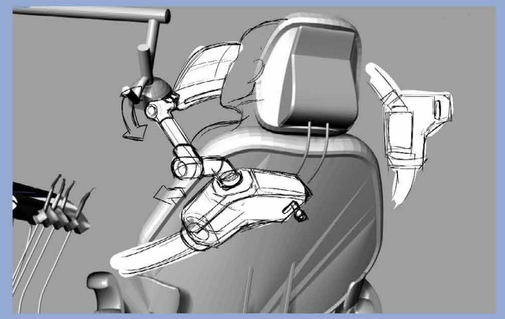


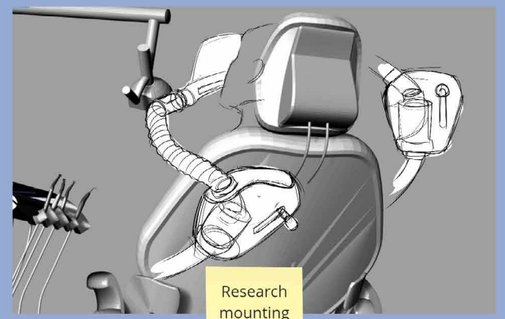












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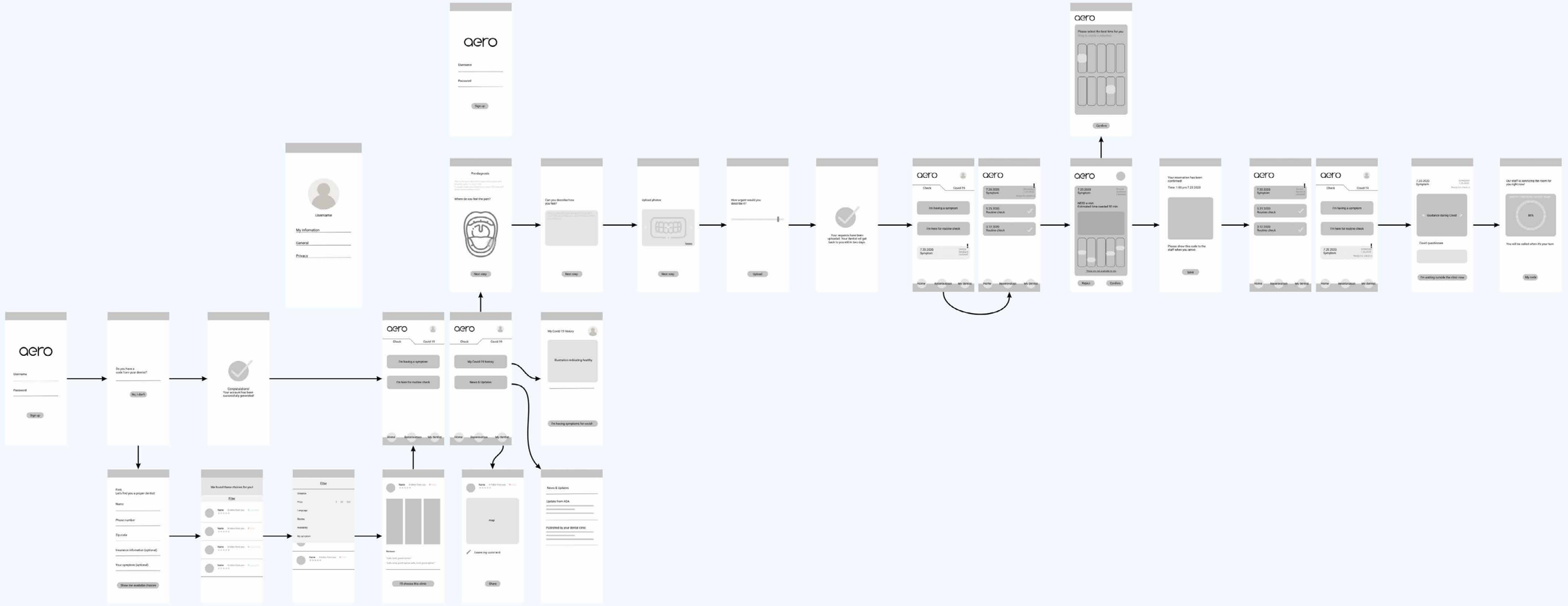
App work flow



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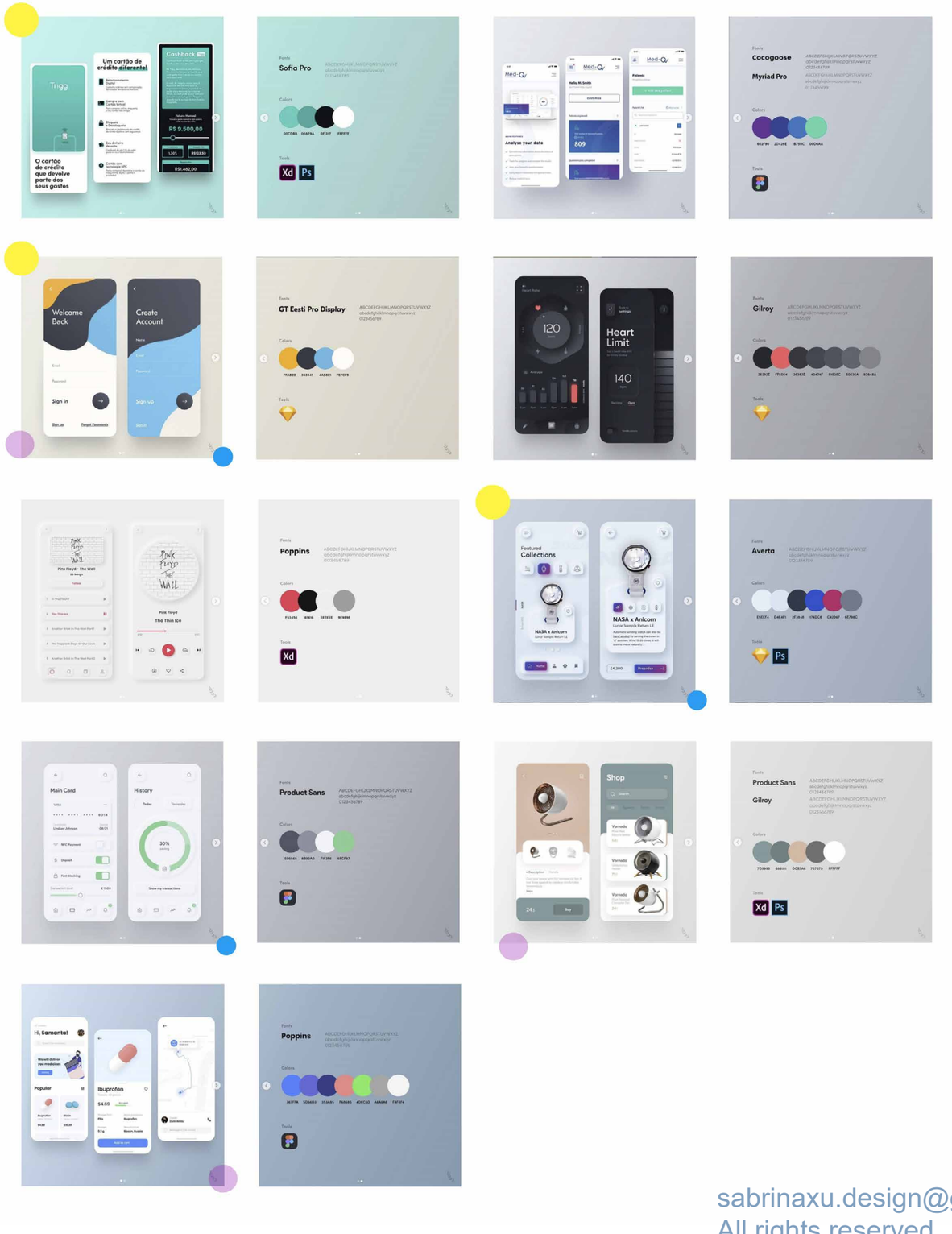
Color palette reference



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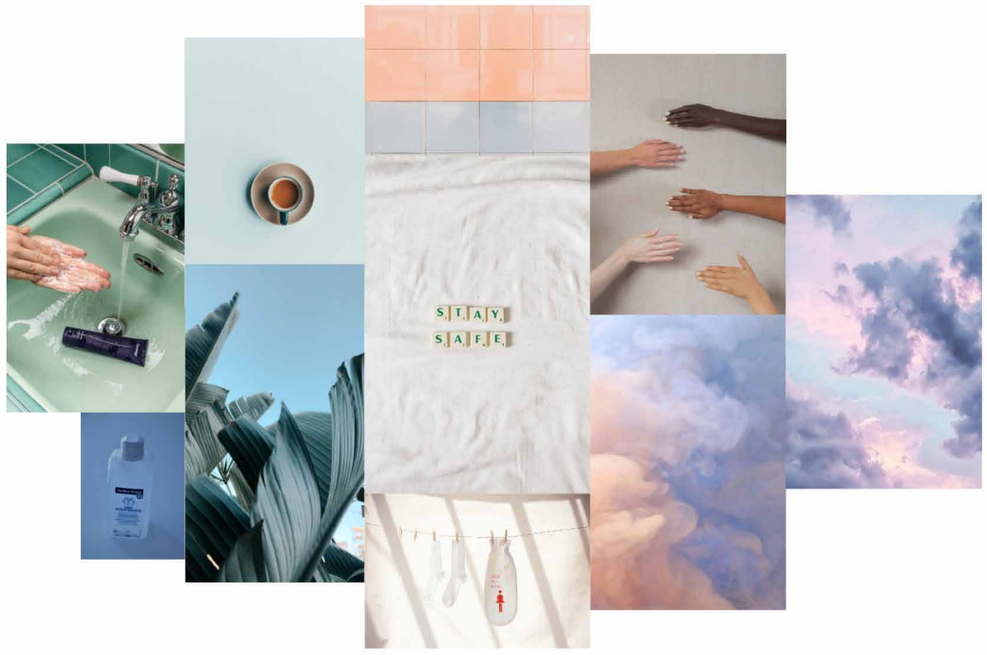
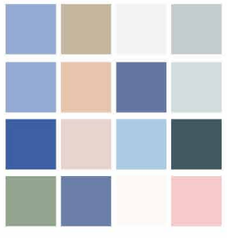
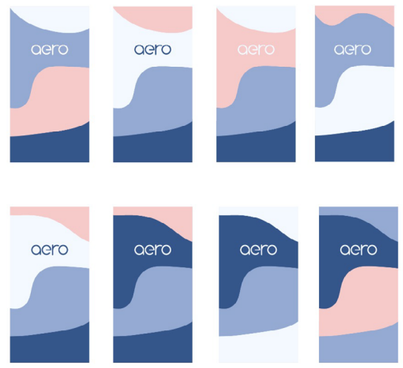
Mood board

Trustful Warm Contactless Convenient United Clean Safe Calm Intimate







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Week 11
App Wireframes & Rough Models

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Connect without Contact

Aero offers supportive product and software for dental clinics to maintain the trust and connection to their clients during the period of pandemic.

Aero Portal

Aero Portal is a digital oral health software that connect patients and dentists during pandemic.

Aero Tunnel

Aero Tunnel is an attachable aerosol vacuum that circulates the air around patient's mouths and prevents aerosol contact between patients and dentists.
Aero tunnel is an attachable aerosol vacuum whose main purpose is to guarantee the safety of both the patient and dentist through circulating air around patient's
Aero tunnel, an attachable aerosol vacuum, focuses on protecting the safety of patients and doctors by preventing aerosol contact.

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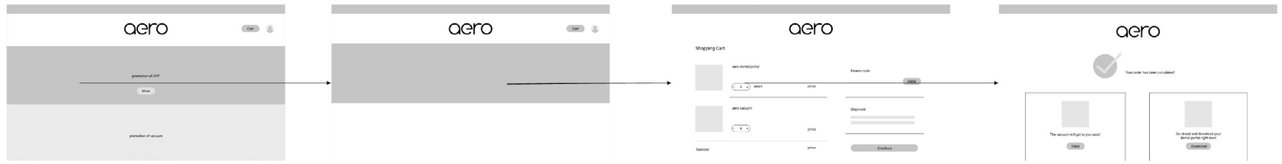
For dentist

website



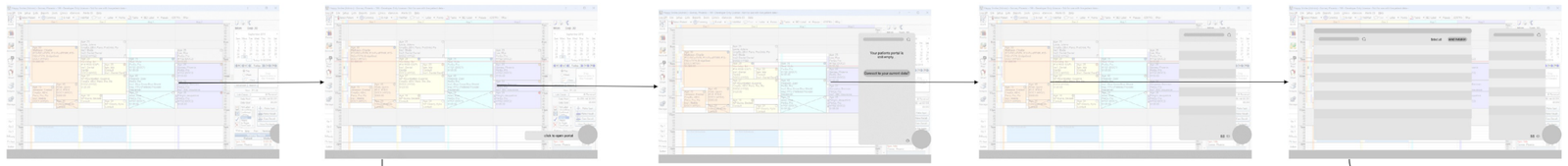
dentist goes to aero website

sees the promotion -
add to cart

cart -
checkout

payment done -
track the vacuum and download
the dental portal

dental portal



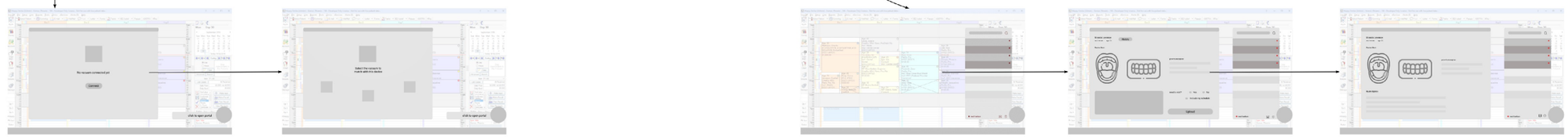
normal stage -
showing the air situation

when hovered over -
click to show the portal

when opened for the first time -
click to connect to your data

data imported

click on the mail icon -
window to send invitation



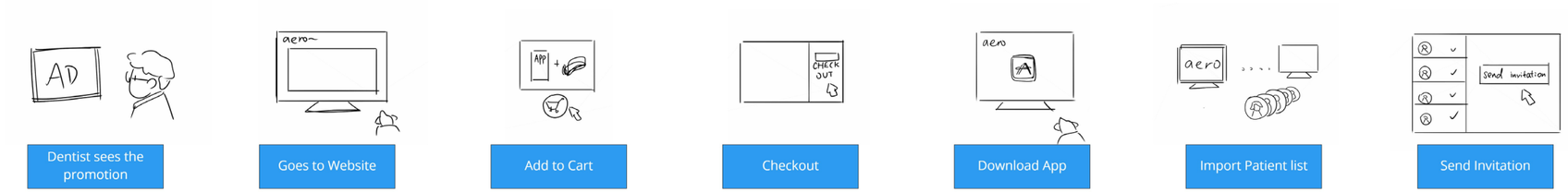
when clicked on the circle -
connect to the vacuum

window opened -
pair

feedback needed stick to the top -
others based on the order of schedule

when clicked on the ones need feedback -
pre-diagnosis

when clicked on the others -
view previous feedback before treatment



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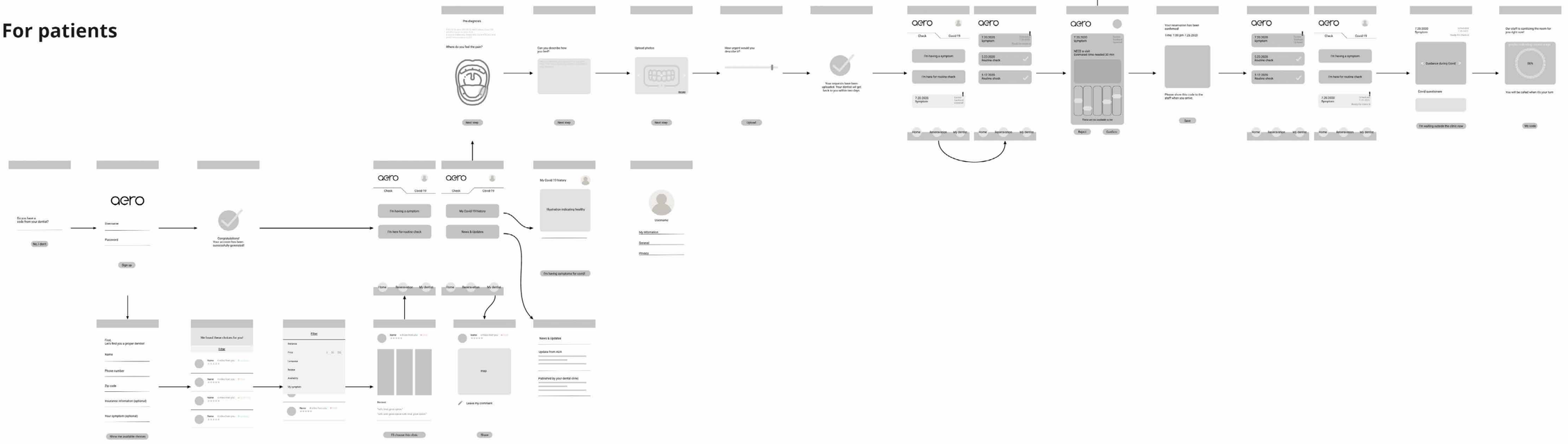
For patients



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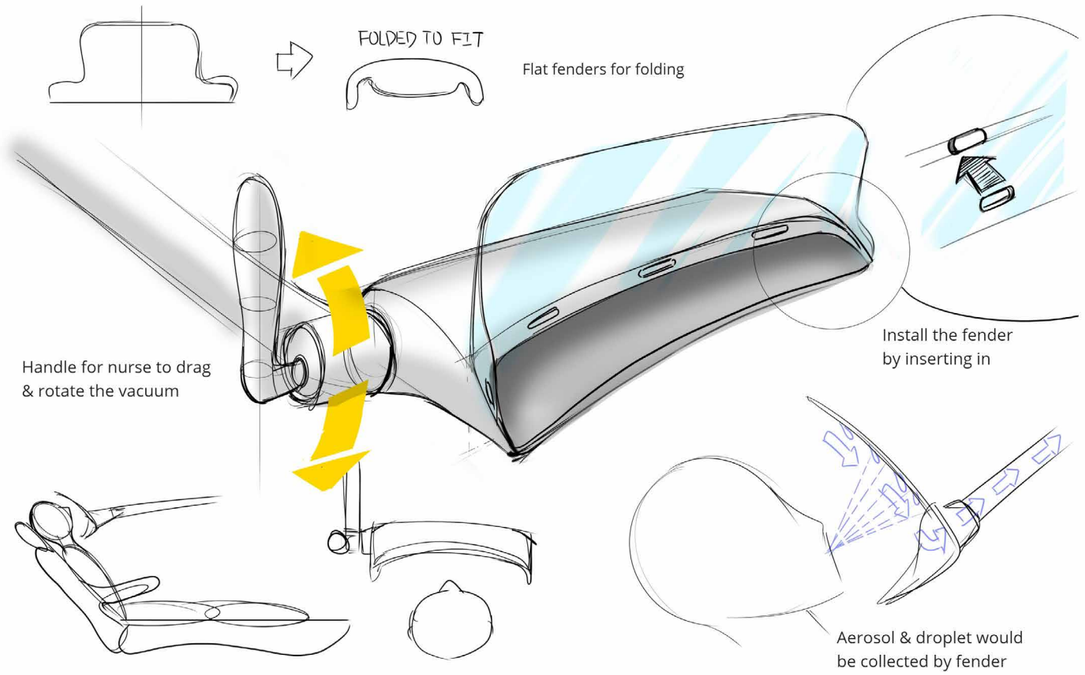
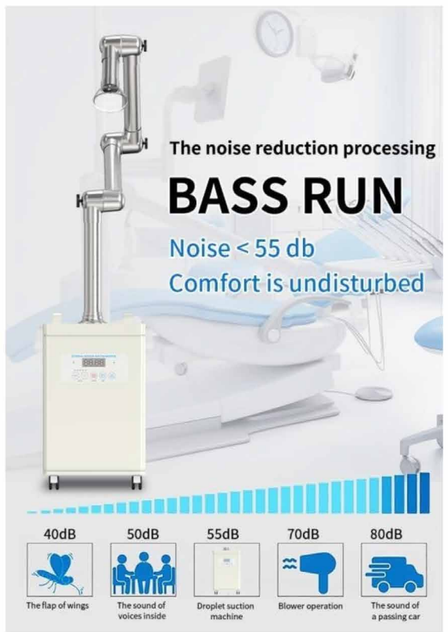
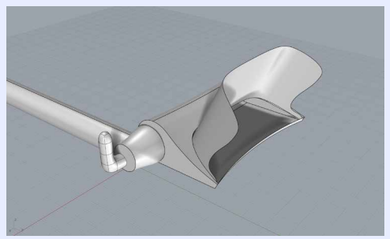
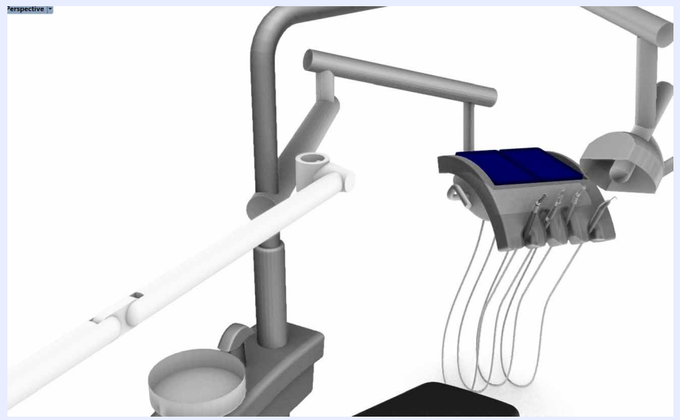
Vacuum form

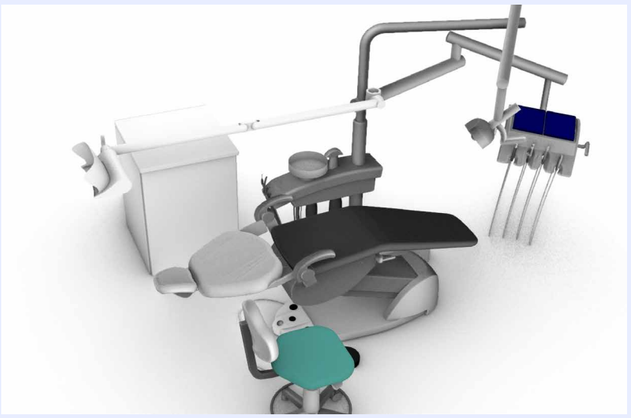


Following same form
language of shadowless light









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Week 12
Final Refinements & Models

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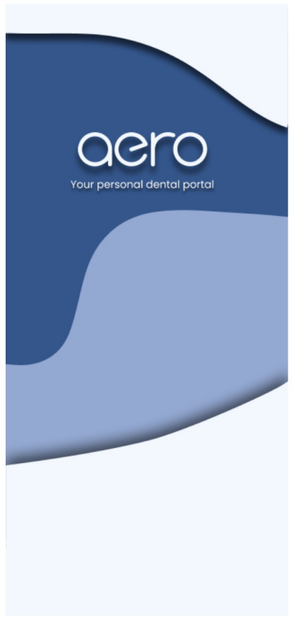
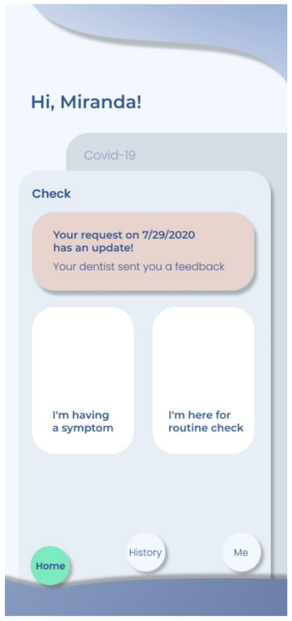
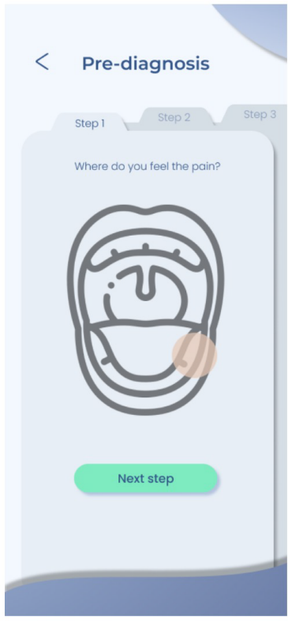
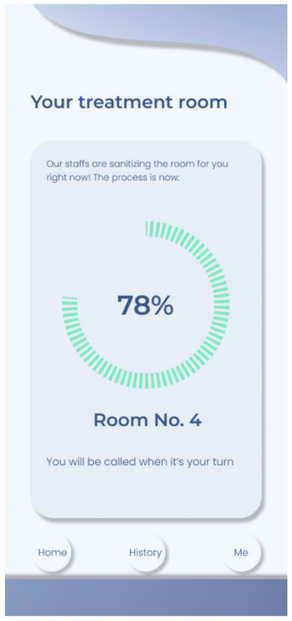
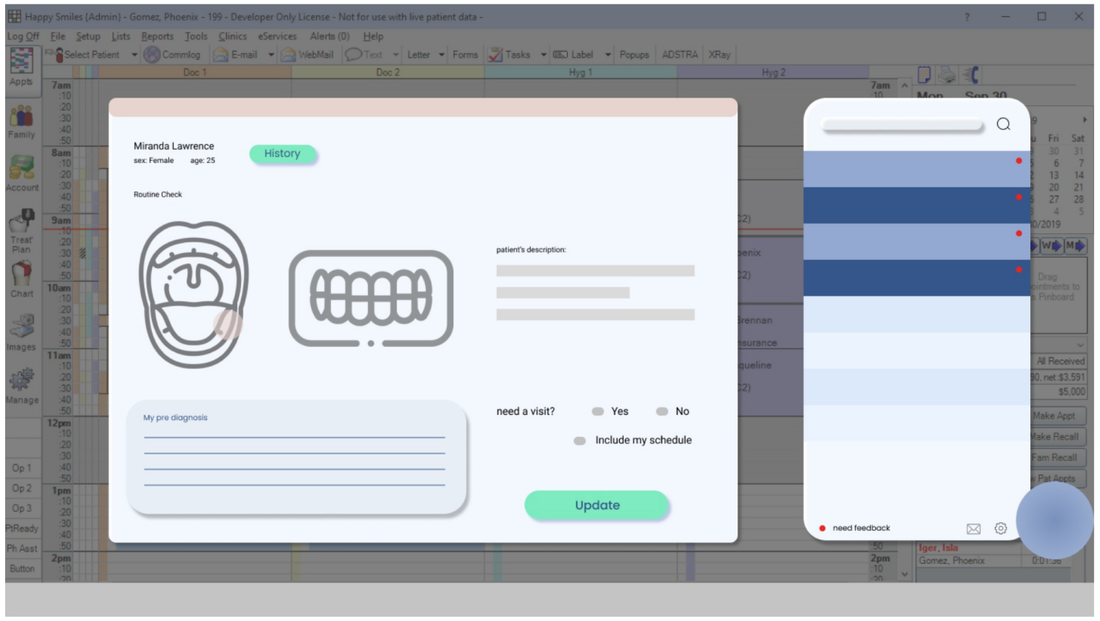
Mobile App & Desktop template











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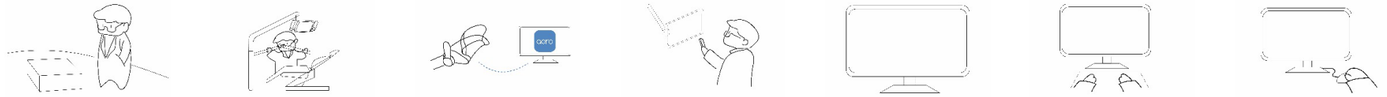
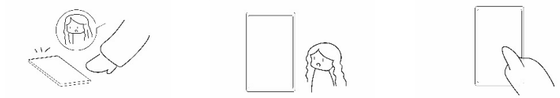
Scenario

Dentist installing

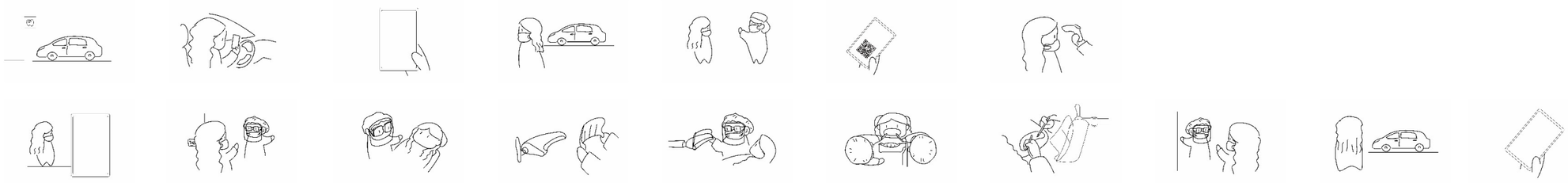
Patient installing & online diagnosis

Dentist installing & feedback





Physical visit



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Packaging for Vacuum

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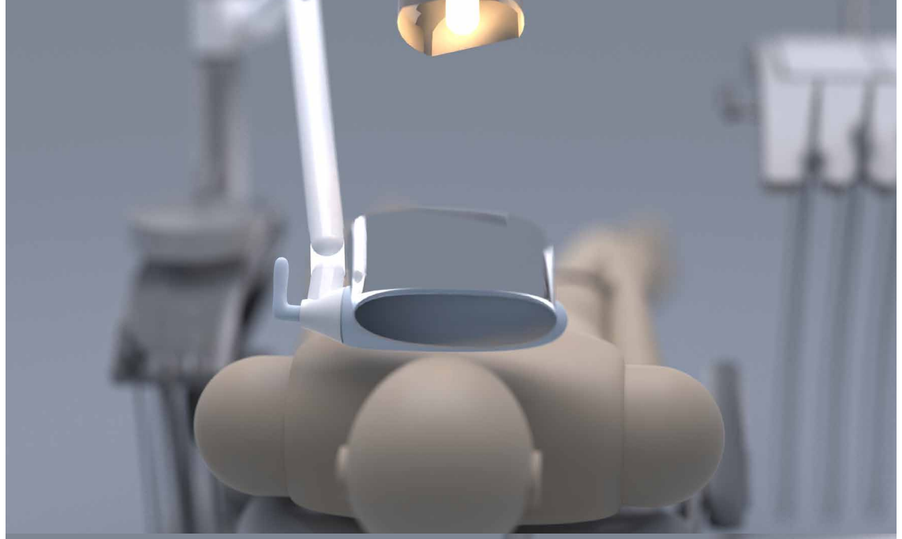
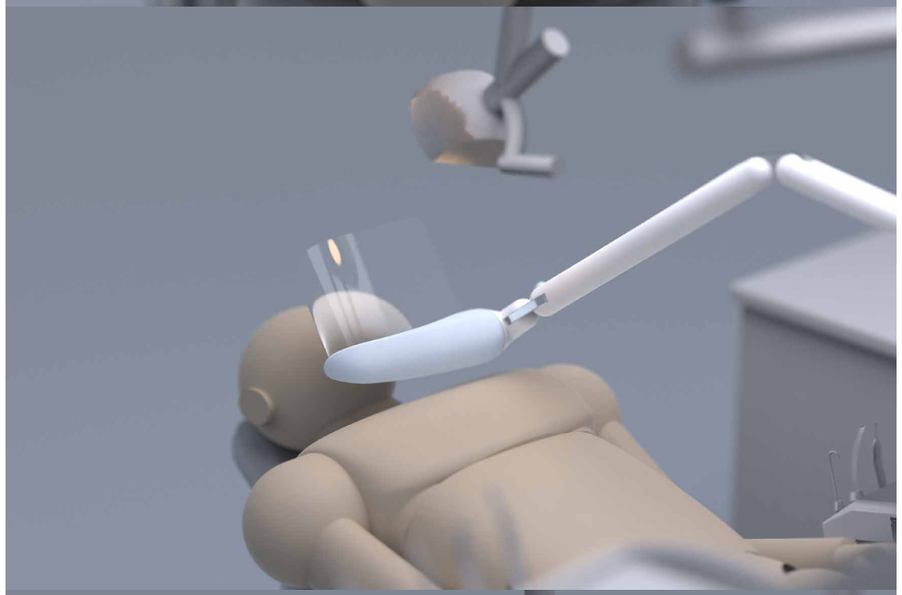
Vacuum Form & Placement





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Week 13 + 14
Final Presentation

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Connect without Contact

Design to help dental clinics during COVID-19

Team D: Sabrina Xu, Kexuan Dong, Emma Zhu, Michael Zhu

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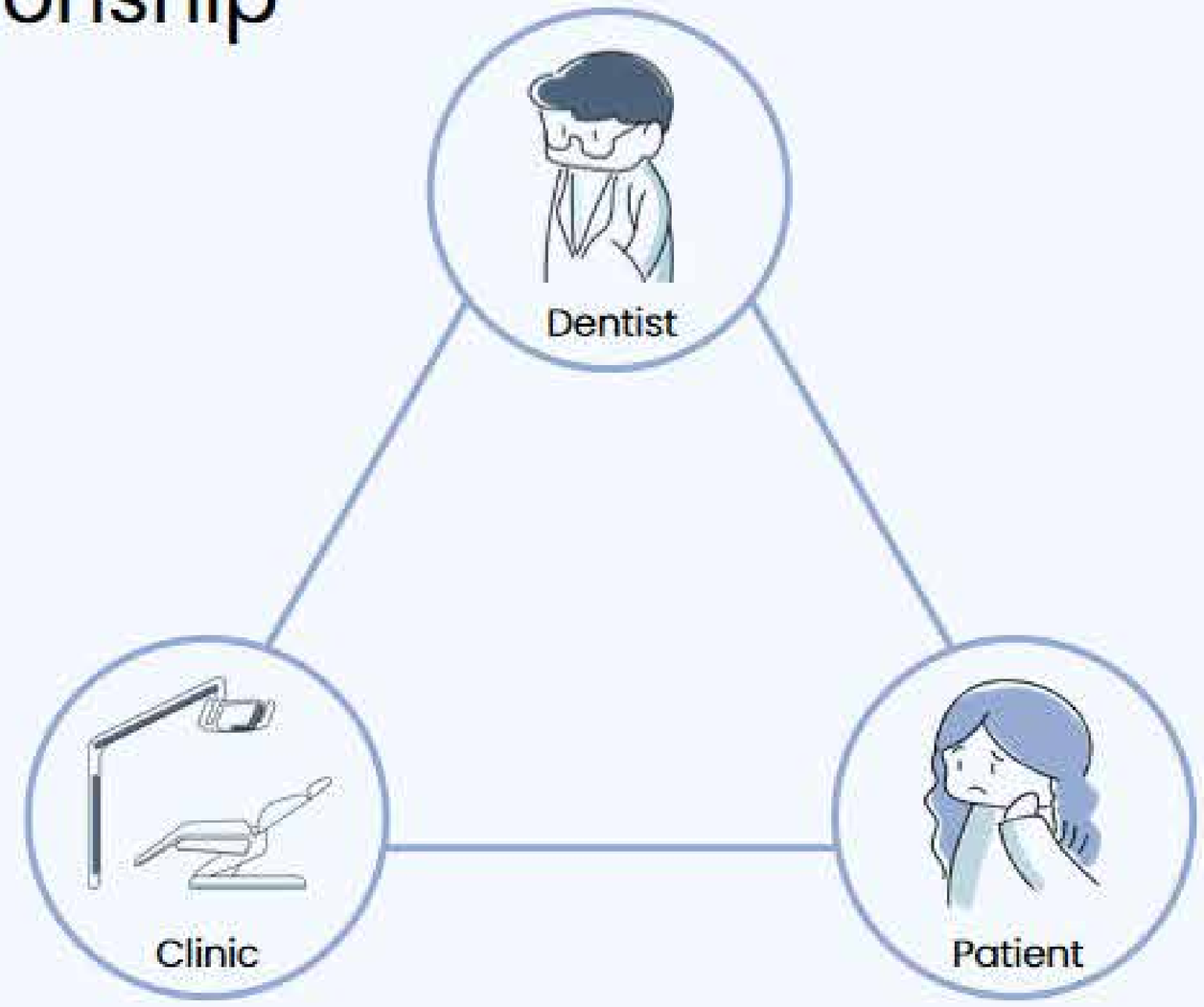
Dental Relationship



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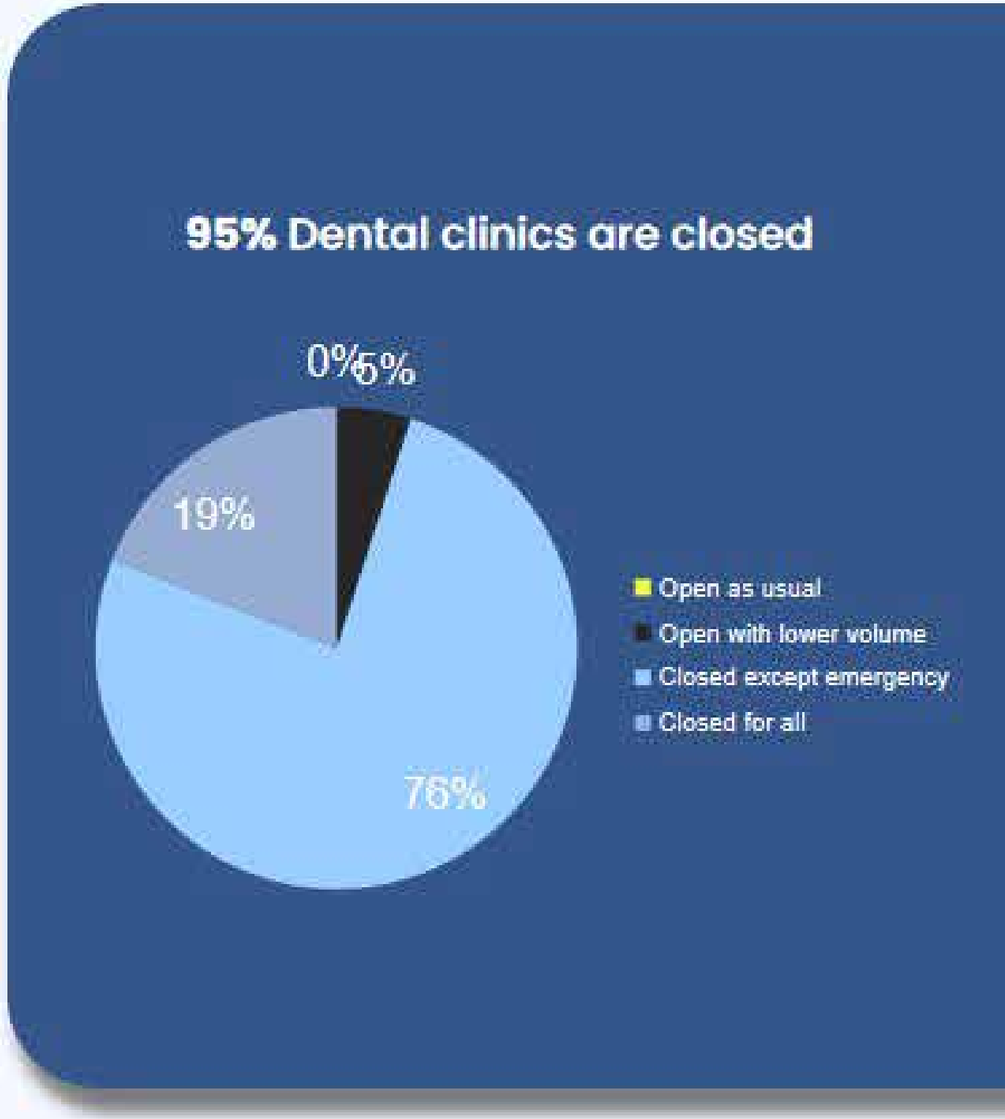

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Dental clinics matter

NECESSITY
Oral hygiene is essential in life.

HIGH RISK
Dental practices involve close contact to infectious aerosol.

SMALL BUSINESS
Dental clinics are usually in smaller so pandemic causes more impact.

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Patient's Word

Allen Mao

Tooth Extraction at
Century Grove Dental Care

- No familiar dentist, had to make lots of calls
- Concern about waiting room
- Concern about aerosol
- Not sure about clinic's action

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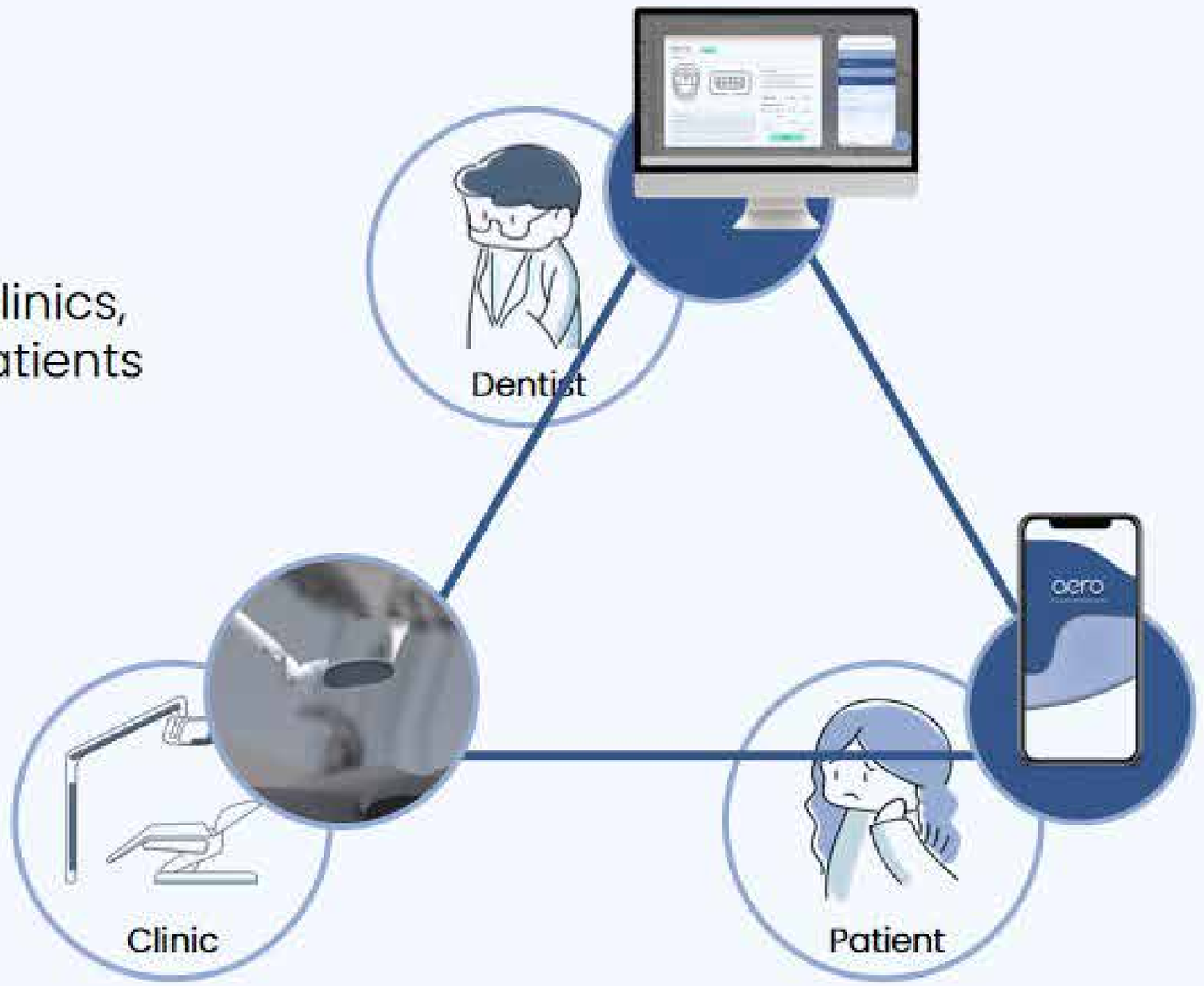
aero helps reopen dental clinics,
connecting dentists and patients
with peace of minds.



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Current Progress

Dr. Konita Wilks

Dental Director at Rancho Research Institute,
Chair of the dental committee of LA County
Department of Health Services

"We put together a task force to take a look at what equipment are the best for dental clinics in LA County to reopen, and they recommended **HEPA filter** and **extra-oral suction**."

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Extra-oral Suction Devices

VacStation

Portable vacuum machine with multiple filter layers and an extended tube to reach to the patients.

Loud, Large, Expensive, Tube can be interruptive

Dentists' Word

"My biggest fear is the aerosol producing during procedures."

Dee Xia,
UCLA Dental Clinic

"Most of my friends have hard time figuring out where to put that big standing vacuum. And it's way too noisy."

Dong Whoon Kim, D.D.S.
Owner of DJ Dental Group
ADA, CDA member

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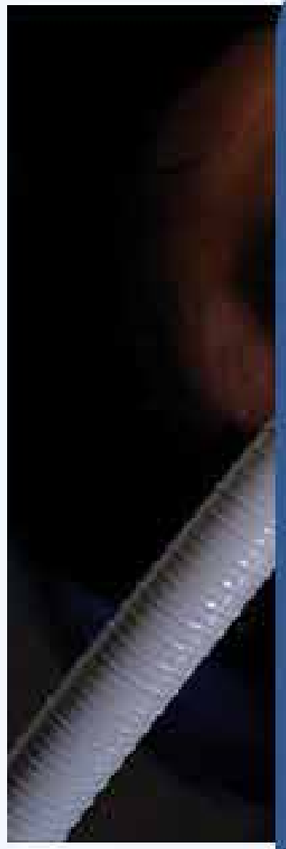
Extra-oral Suction Devices

VacStation

Portable vacuum machine with multiple filter layers and an extended tube to reach to the patients.

Loud, Large, Expensive, Tube can be interruptive

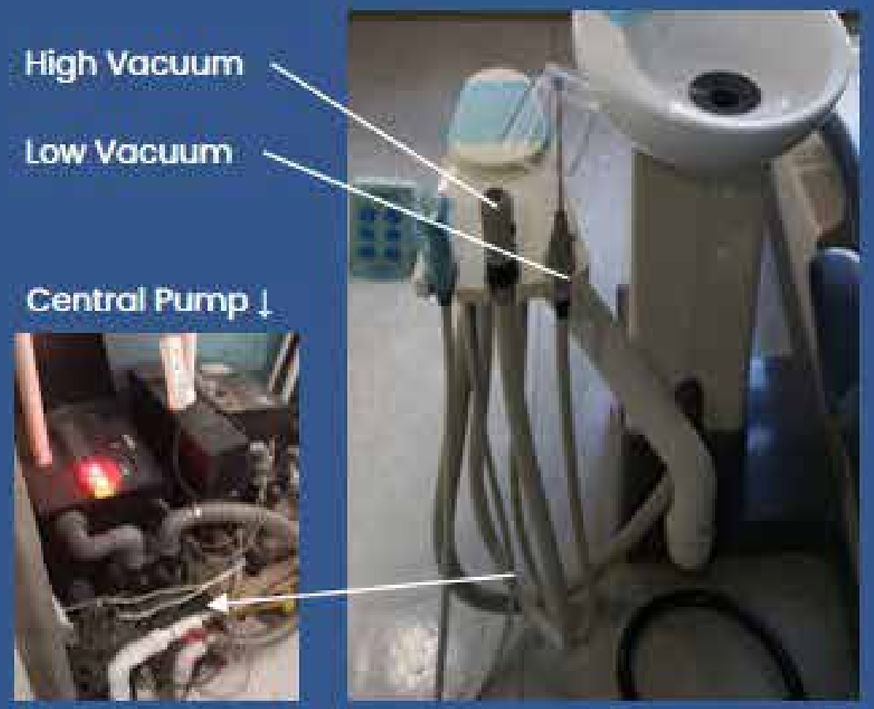


WS Aeros

Aerosol suction
directly to denta

Hard to put on, intimidating, no regular suction

Clinic Layout



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What have we learned?

Dental experience goes beyond treatment

- Remote consulting
- Reservation management

Patients feel vulnerable during treatment

- Design to build trust
- Make patients feel less intimidated

Dental setup is hard to modify

- Addition vs. renovation
- Adapt to current workflow

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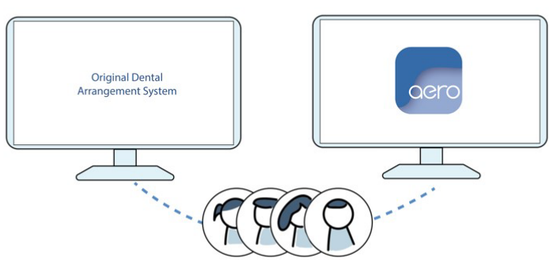
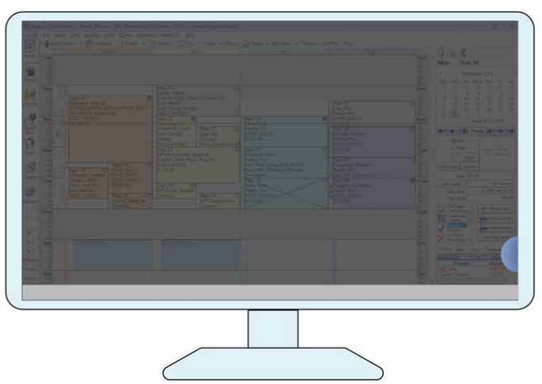
Scenario story





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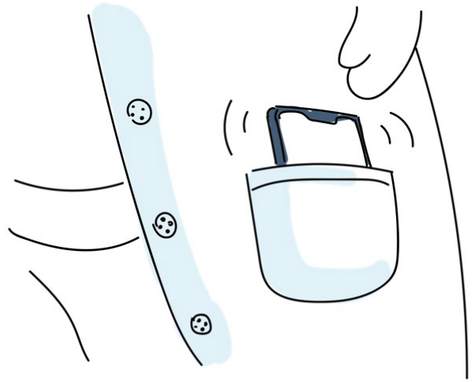
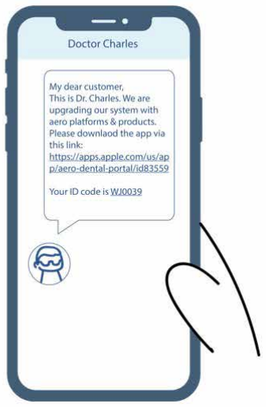
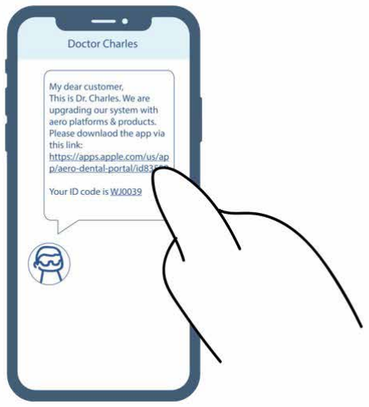
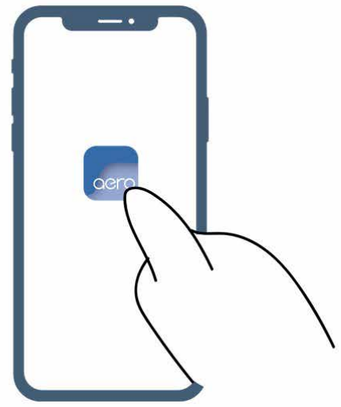
Meanwhile...









Next Day...

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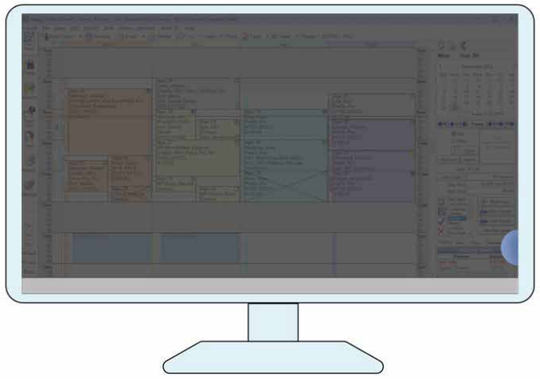

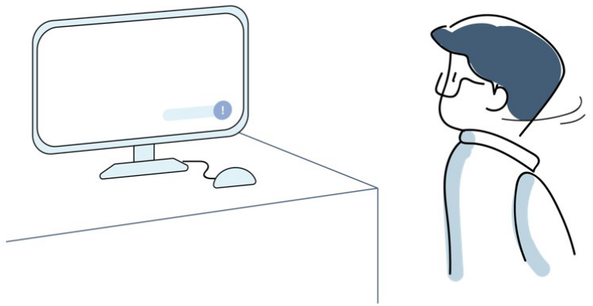

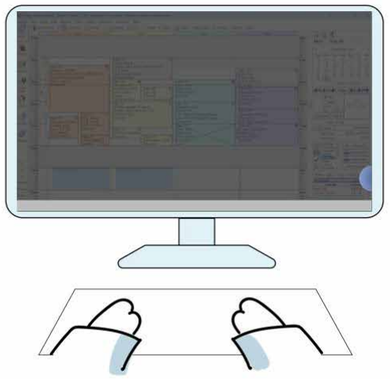

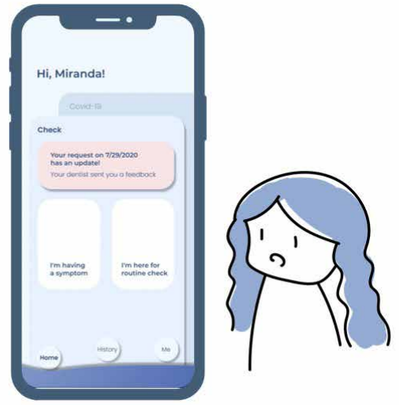

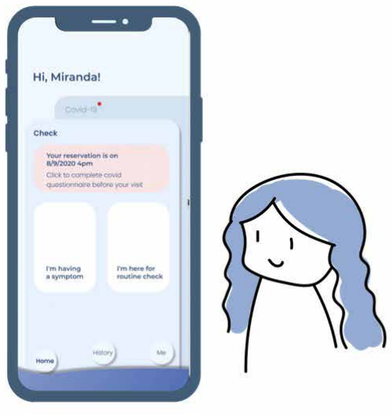

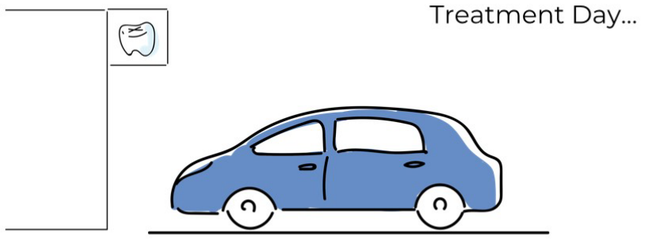

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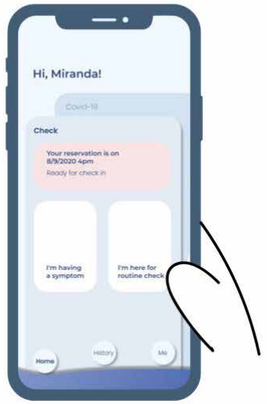

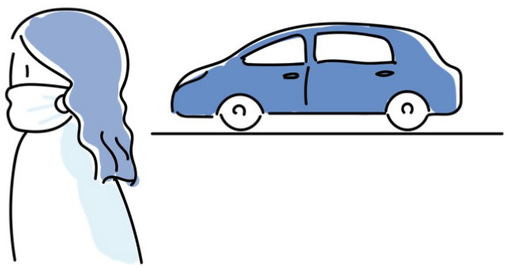

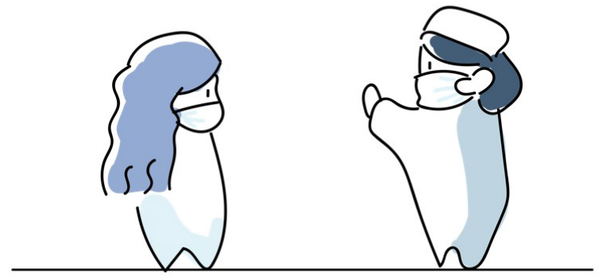

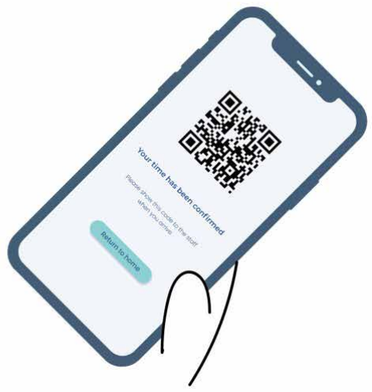

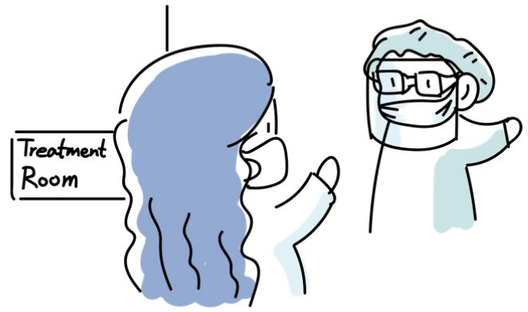

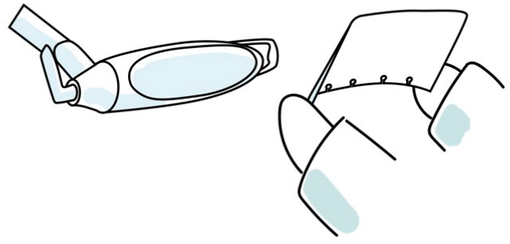

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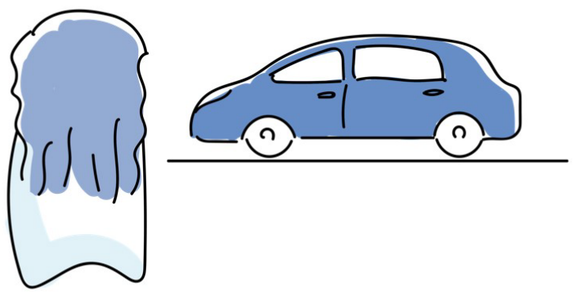

One day our dentist looks at the aero website and he notices that there are two products available to build a cleaner and safer clinic. He purchases the two products and then downloads the arrow portal. The first thing he does is to connect aero portal to the existing system. After he loads the patients list into the aero, he sends his patients a text message notifying them that this clinic has equipped with aero system.

Meanwhile our patient Miranda has toothache, but she's concerned about whether she should go to her dental clinic during this pandemic. Suddenly she received a text from her dentist telling that she can now consult with her dentist online. There is also a code to import import all her medical history and personal profile to the app.
She clicks the link and downloads aero portal. She type in the code given from her dentist and import her medical history. After that, she chooses to consult with her dentist. She's asked to describe her illness and take a picture. During the process there are popup guidance on the screen to guide her to take a better picture. She has to go to the balcony where there are sunlight, and finally she submits a request to her dentist.

Next day, Dentist receives an aero tunnel. In the desktop app he can connect the product to the portal to better monitor the product’s status. When he's installing the aero tunnel onto the center pole of the dental operatory, there's a notification on his screen. He looks back at the notification, It’s the patients’ requests. He takes a look and writes down his feedback according to the description and pictures. He thinks that Miranda definitely needs to visit the clinic so he selects several of his available time slots.

Miranda has received dentist feedback, she also selects her available time slot and the appointment has already been scheduled. At this time she is required to take a COVID-19 questionnaire to make sure that she doesn't have any symptoms.

On the treatment day, Miranda is instructed to wait in the car. While she is waiting, she starts the check-in process, which involves a COVID-19 safety guidance and another questionnaire to further confirm that she doesn't have any symptoms. After she finishes the questionnaire, she takes a look at the real-time room status, it shows that room is being cleaned by the assistant. When her time is up, the app generates a code for her to show to the assistant. Miranda puts on her mask and goes to the clinic. She's stopped by an assistant, she's asked to show her check-in code, the assistant measures her body temperature and shows her the way in. She meets her dentist in the treatment room, she lies down and sees the dentist put on a brand-new shield onto the aero tunnel.

The dentist pulls the air intake closer and it starts working right away. During the treatment, they are not afraid of aerosol at all because the aero tunnel sucks in all the aerosol and the plastic shield acts as an extra physical barrier. When the treatment is finished, they all feel safe and secure. As Miranda goes out of the clinic to her car, she thinks that this is a really good dental experience, especially in this special time.

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This is...

aero

aero dentists portal

aero patients portal

aero tunnel

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aero patients portal

Sync data with code

Take pictures,
Submit,
get feedback

Choose time slots

Dentists' Word

"We provide simple pre-diagnosis to patients through photos and phone calls"

"There is questionnaire about COVID symptoms released by CDA, most clinics are following that standard."

Dee Xia,
UCLA Dental Clinic

"Assistants wipe everything down with disinfectant cave wipe and replace tape. People don't see it."

Scott Jeon, D.D.S.
Pacific Dental Care

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aero dentists portal

Non-invasive tray

Feedback, Chat history, Schedule

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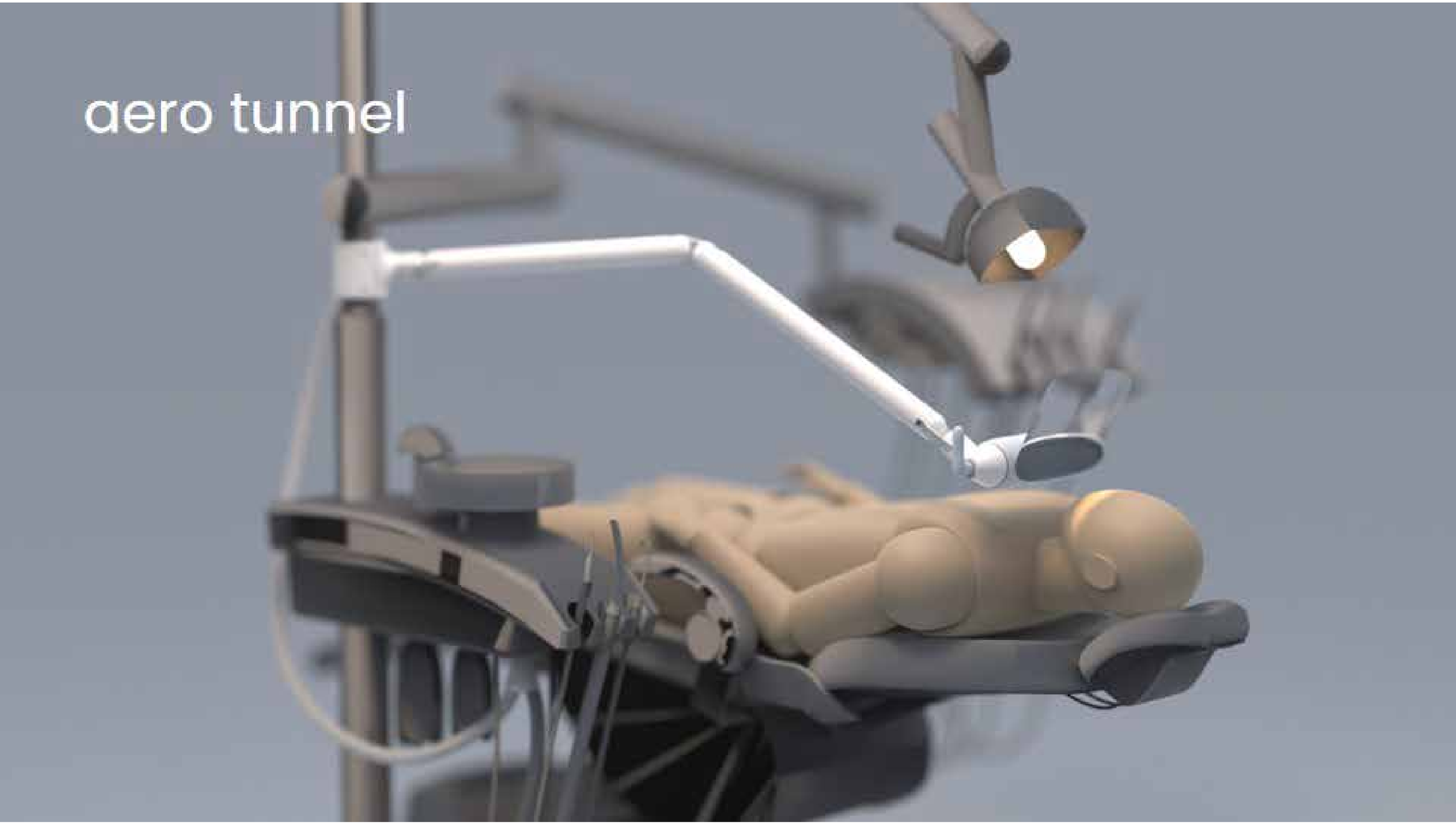
aero tunnel



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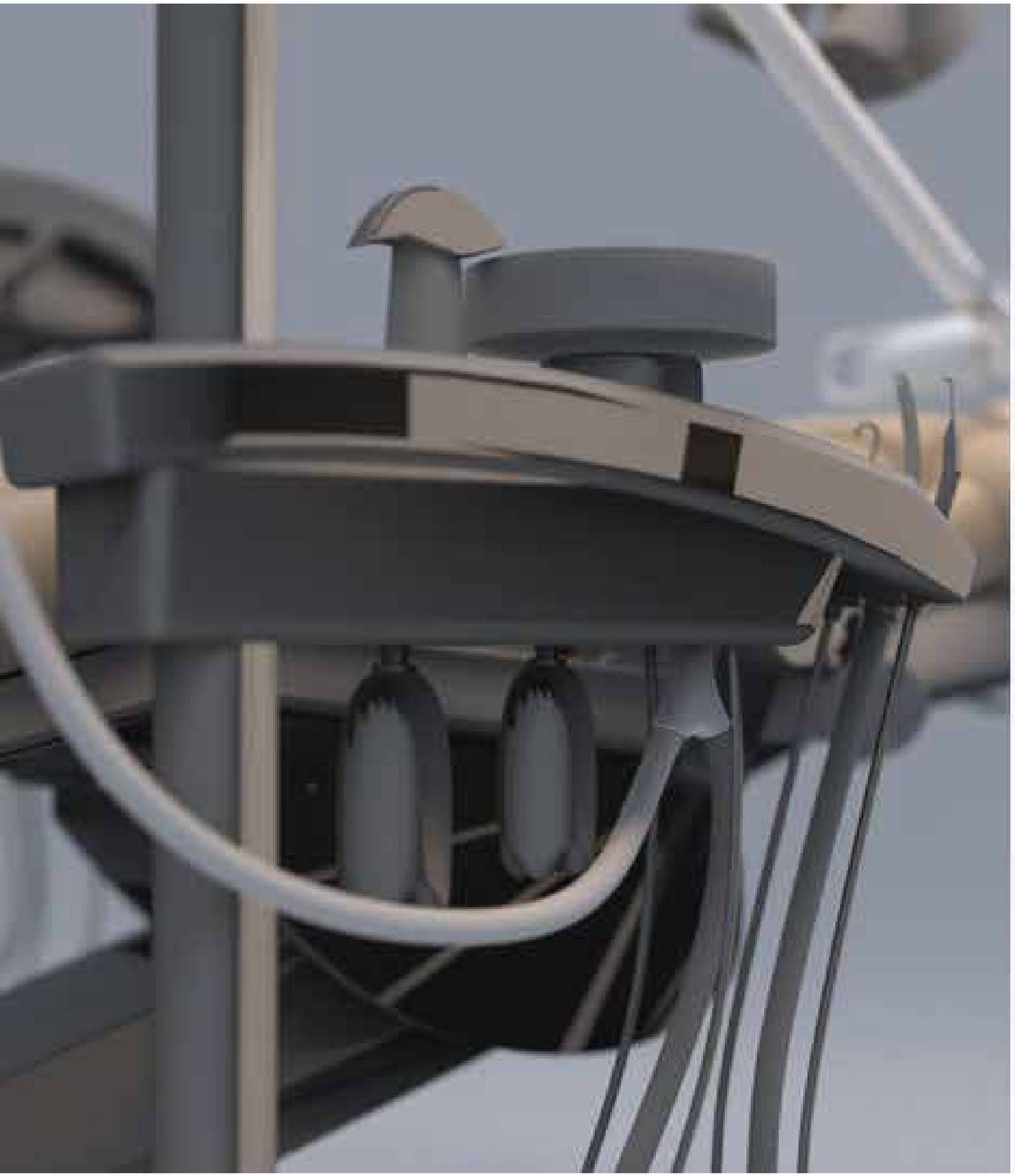

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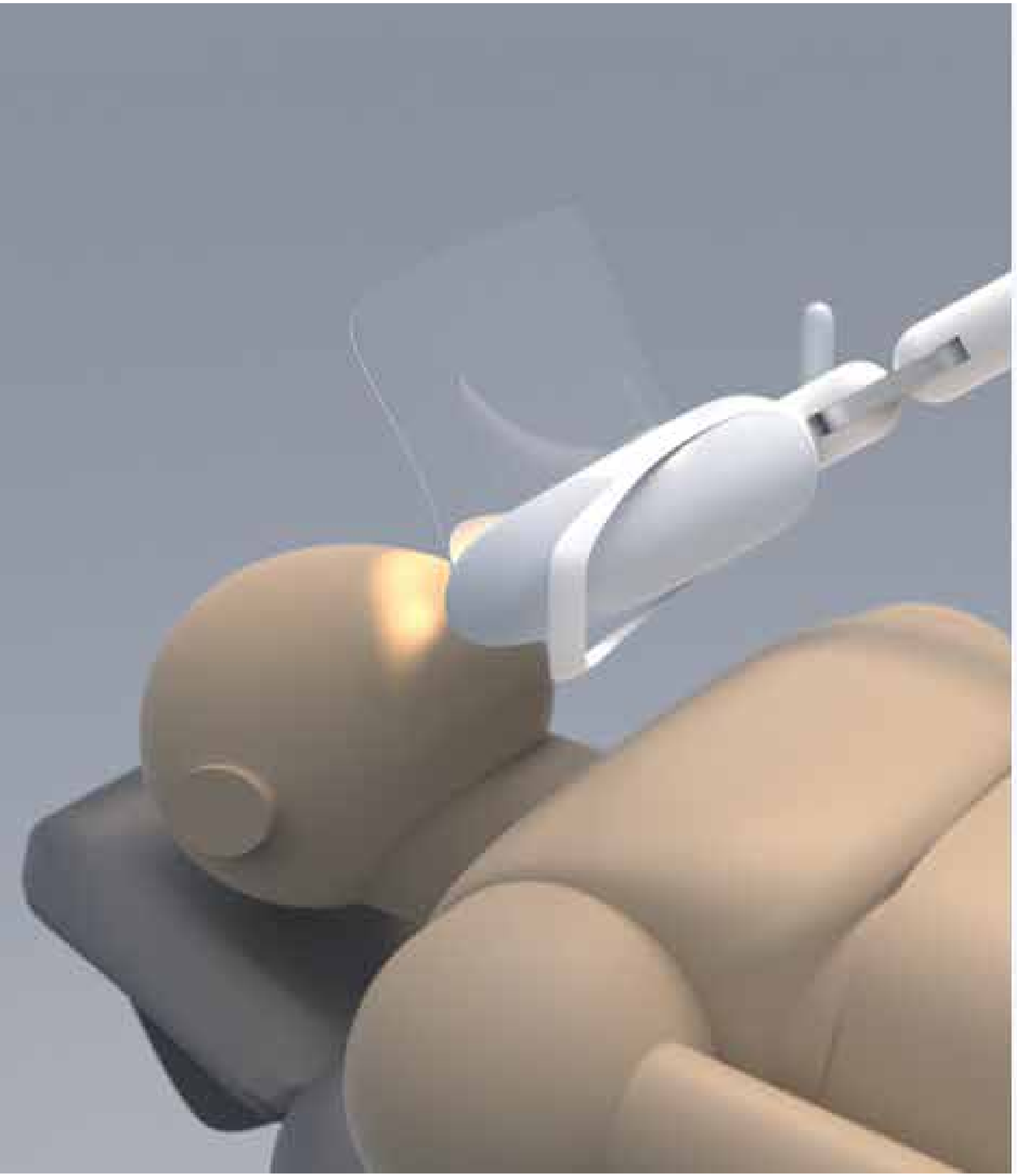

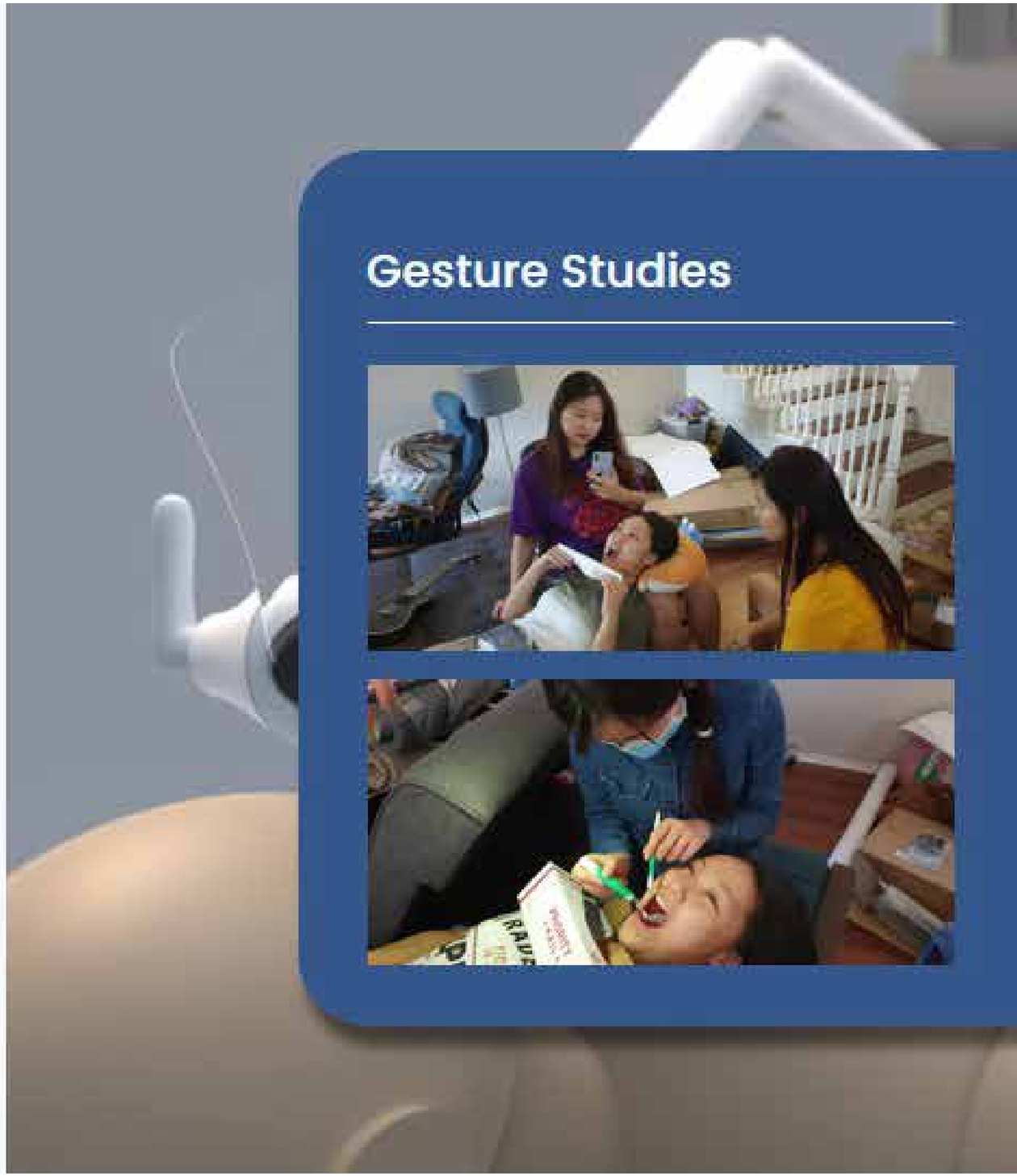

Gesture Studies

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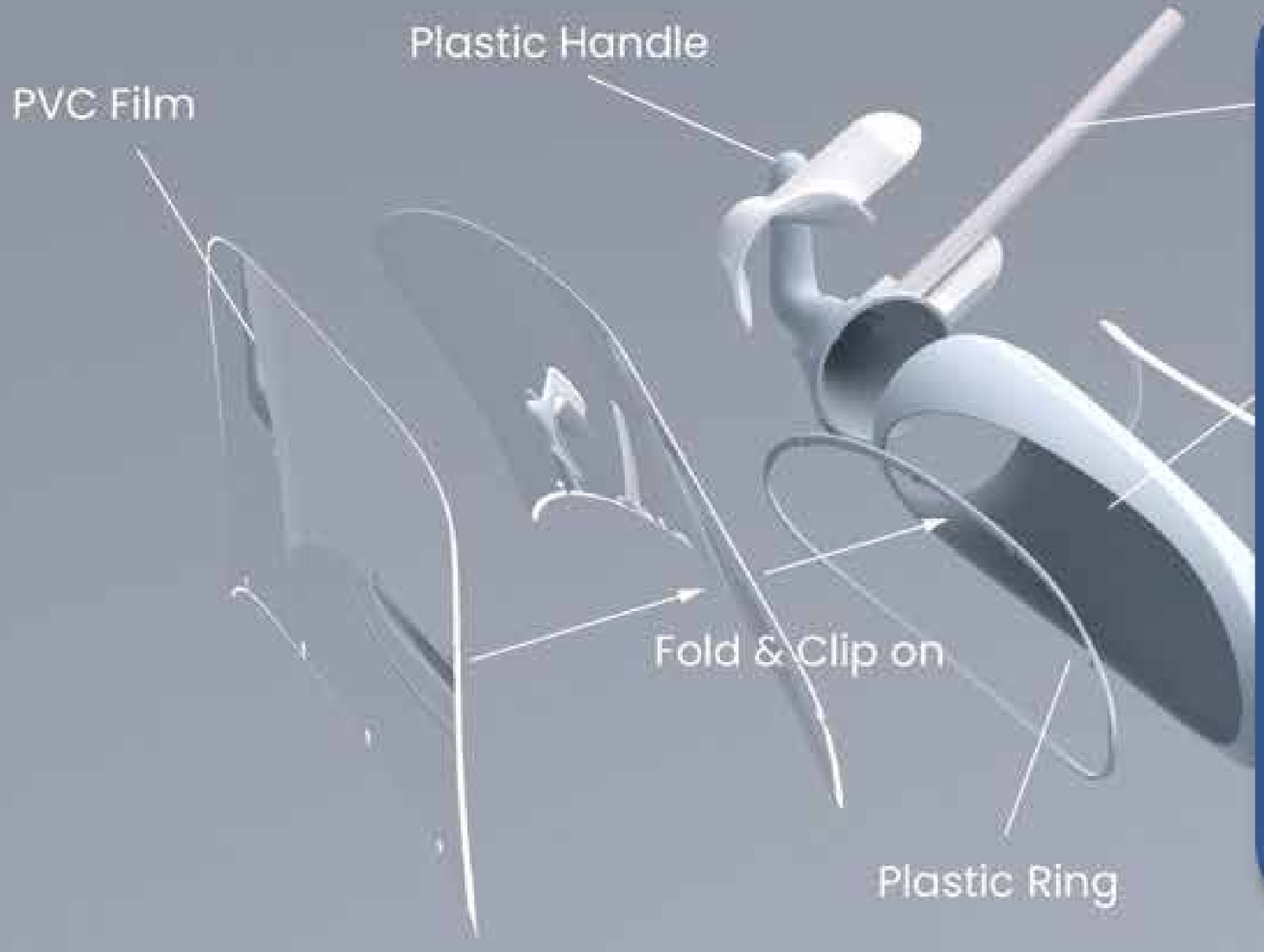
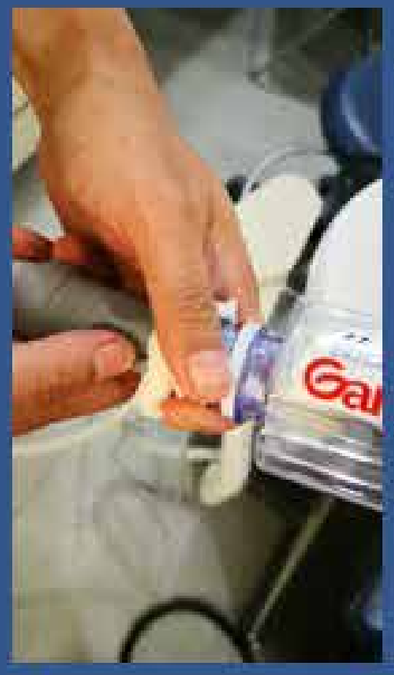


Proof of Concept



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Instruction on Package

Installation Guidance

Shield Pack

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Development Strategies

- Short Term
  - Promote to dental clinics: “aero system helps you get back on track.”
  - Dental clinics connect to patients through aero portal.
  - Promote to patients: “aero makes clinics get safer and cleaner.”

- Long Term
  - Develop more attachment devices & connect to aero portal.
  - Collaborate with dental equipment companies for more integrated solutions.

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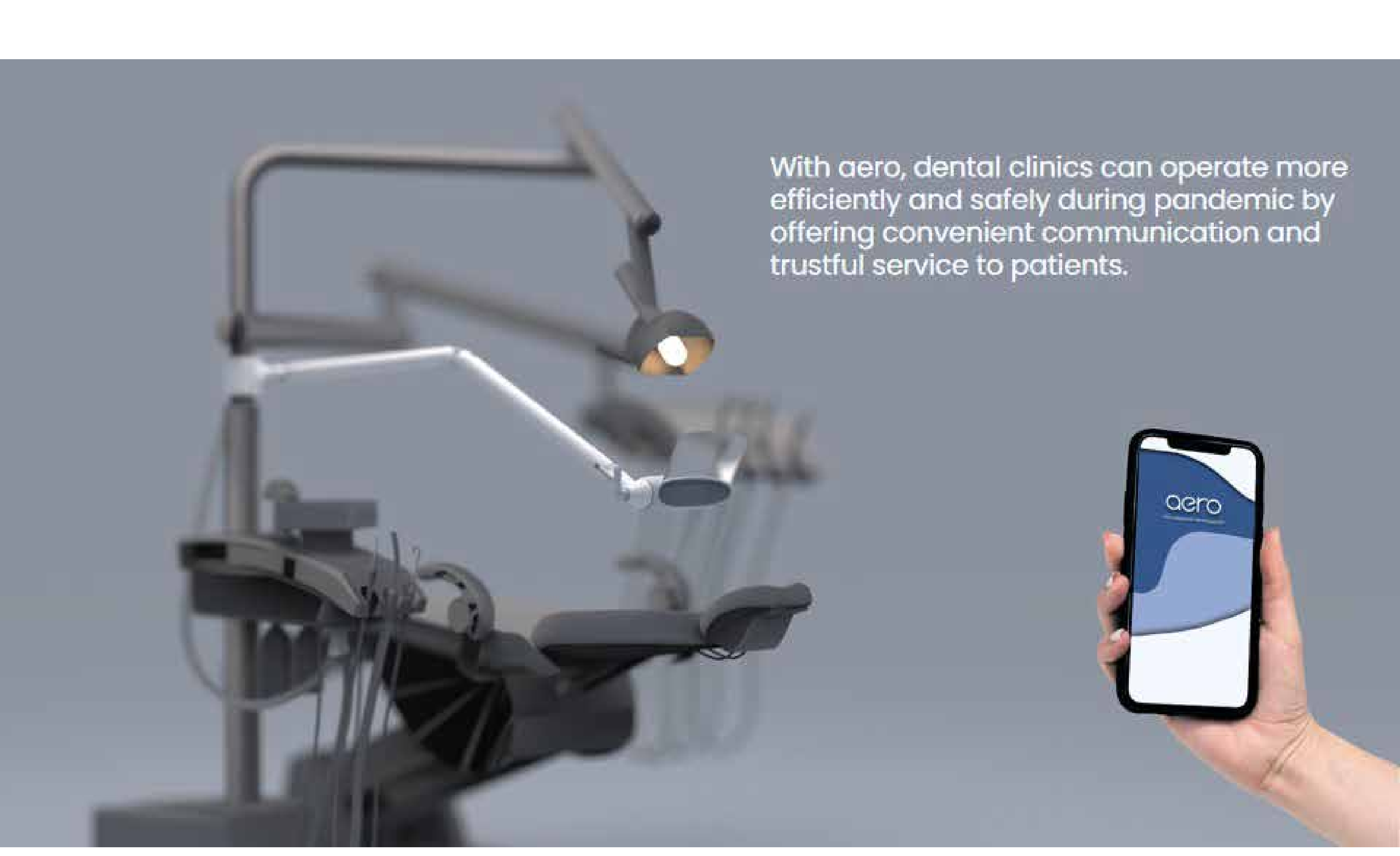
With aero, dental clinics can operate more efficiently and safely during pandemic by offering convenient communication and trustful service to patients.



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Thank you

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